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Permit Applicants' Guide Manual for Hazardous Waste Land Treatment Storage and Disposal Facilities

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This manual explains the EPA permitting process, the facility standards, and the application information requirements. It describes the level of detail needed in a permit application to show how the facility design complies with specific standards. Useful references to other EPA manuals and to the professional engineering and hydrogeologic literature are provided.

This manual is written for persons who must file applications with the EPA for Federal permits to operate facilities that treat, store, or dispose of hazardous waste in surface impoundments, waste piles, land treatment units, and landfills. Authorized States that administer their own programs may have different permitting procedures not covered in this manual.

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PREFACE TO THE FINAL DRAFT

This final draft of the Permit Applicants' Guidance Manual for Hazardous Waste Land Treatment, Storage, and Disposal Facilities provides permit applicants with detailed information on what a RCRA Part B permit application should contain. It presents recommended methods for collecting and presenting information that responds to the application information requirements in 40 CFR Part 270. Guidance is also provided on facility designs that EPA believes satisfies the permitting standards in Part 264 for surface impoundments, waste piles, land treatment units, and landfills. This guidance is identical to that provided in the (draft) RCRA Technical Guidance Documents, which have been made available for public comment. However, this guidance is not intended to mean that other designs might not also satisfy the standards.

This manual and other EPA guidance and resource documents do not supersede the regulations promulgated under RCRA and published in the Code of Federal Regulations. They provide guidance, interpretations, suggestions, and references to additional information. Regulations will always take precedence to these manuals.

This manual is identified as a Final Draft due to the likely imminent reauthorization of RCRA by Congress. The manual contains regulations and recommendations related to regulations in effect in March 1984. Subsequent to reauthorization, this manual will be revised.

ACKNOWLEDGEMENTS

This manual was prepared by the Land Disposal Branch of the Office of Solid Waste. The principal editor was Arthur Day. Other EPA personnel providing major contributions were Michael Flynn, Paul Cassidy, and Laurel Kasaoka.

Consultants played major roles in the preparation of the manual. Gary L. Mitchell of SCS Engineers compiled comments on the Draft version of the manual, incorporated them into this Final Draft, and provided editing and production support. The section on surface impoundments, waste piles, and landfills were initially prepared by Joe Kulikowski and others from Ertec, Inc. and Douglas Hazelwood and others with A.T. Kearney, Inc. The land treatment section was initially developed by Gordon Evans and others of K.W. Brown, Inc. GCA, Inc. and TRW, Inc. prepared the checklists. The diagrams in Section 9.0 concerning ground-water protection were based on concepts developed by David Hupe of Michael Baker, Inc. Appendix D was prepared by Dr. Jean-Pierre Giroud.

EXECUTIVE SUMMARY

Don't panic. This is a "user friendly" manual. It is written for persons who must file applications with EPA for Federal permits to operate facilities that treat, store, or dispose of hazardous waste in surface impoundments, waste piles, land treatment units, and landfills. Authorized States that administer their own programs may have different permitting procedures not covered in this manual.

The manual explains the EPA permitting process, the facility standards, and the application information requirements. It describes the level of detail needed in a permit application to show how the facility design complies with specific standards. Useful references to other EPA manuals and to the professional engineering and hydrogeologic literature are provided.

The Introduction describes the overall organization of the manual. Section 2.0 describes the EPA administrative procedures. Section 3.0 reviews the permitting standards in 40 CFR Part 264. It shows how an applicant can decide which standards apply to his own facility, and describes related EPA technical guidance and resource documents.

Section 4.0 provides general guidance for the preparation of a RCRA permit application. It includes suggested formats for applications and information applicable to all facilities covered in this manual.

Sections 5.0 through 9.0 provide detailed guidance on permit applications. One section is devoted to each type of facility and a separate section to ground-water protection. Guidance is based upon the permitting standards in Part 264, information from the Preamble in the Federal Register, and the RCRA Technical Guidance Documents. It includes guidance on general designs that EPA believes satisfy the permitting standards. Recommendations on how to address each application information requirement from 40 CFR Part 270 are then presented, showing the type of information and level of detail EPA needs. Applicants should thoroughly review the section applicable to the type of facility proposed and also review Section 9.0 concerning ground-water protection prior to beginning preparation of a permit application.

Sections 5.0 through 8.0 contain checklists of all the information requirements and associated permitting standards that an applicant for a land treatment, storage, or disposal facility may need to address, depending on facility type, exclusions, and variances. These checklists can be used to review the completeness of the application by both applicants and EPA reviewers.

EPA encourages applicants to make thorough use of this manual; it will help minimize the effort and time spent in filing permit applications. Applicants are also encouraged to direct questions not answered by this manual to EPA Regional Office personnel.

SECTION 1.0

INTRODUCTION

The U.S. Environmental Protection Agency (EPA) has issued regulations to ensure the protection of human health and the environment through the proper management of hazardous wastes under Subtitle C of the Resource Conservation and Recovery Act of 1976 (RCRA). These regulations require the owners and operators of facilities that treat, store, or dispose of hazardous wastes to obtain RCRA permits for their activities. The permit application must contain sufficient information to assure EPA that the facility design, operation, closure, and post-closure care satisfy the permitting standards. This Guidance Manual is intended to minimize the effort and time expended by persons applying for RCRA permits.

This manual was written to help preparers and reviewers of permit applications better understand the application information requirements for facilities that treat, store, or dispose of hazardous waste directly in or on the land. Such facilites are classified under one of the following categories.

- Surface Impoundment
- Waste Pile
- Land Treatment Unit
- Landfill

Although not mandatory, the use of this Guidance Manual in preparing a permit application should enable the applicant to efficiently organize and present information needed by EPA to evaluate the application in a knowledgeable and expeditious manner. For a more detailed explanation of EPA objectives and strategy to promote safe hazardous waste management practices, the applicant is strongly urged to read the preamble to the 40 CFR Part 264 land disposal regulations published in the Federal Register, Volume 47, No. 143, page 32274, on July 26, 1982.

The guidance in this manual is applicable to Federal programs. States are encouraged to develop and administer their own programs under RCRA section 3006. Approved State programs may differ in substance, style, and procedure, thereby limiting the utility of this manual in those States. Applicants should consult their EPA Regional Administrator or State authority if they are uncertain about the status of a particular State program.

The remainder of this Manual is organized as follows.

Section 2.0 - Administrative Procedures in the Permitting Process.

This section presents the administrative and confidentiality procedures used by EPA in the RCRA permitting process.

Section 3.0 - Permitting Standards and EPA Guidance and Technical Guidance Manuals.

This section presents the general subject areas covered under 40 CFR Part 264 and associated Part 270 regulations; methods to determine what standards apply to a particular facility; RCRA relationship to other Federal statutes; and a description of documents that may be useful to permit applicants.

Section 4.0 - General Guidance for Preparing a RCRA Land Disposal Permit Application.

This section provides general guidance for the preparation of a RCRA permit application. It includes suggested format for applications and information applicable to all facilities covered in this Manual.

Section 5.0 through 9.0 - Permit Application Guidance.

Individual sections providing detailed guidance on permit applications related to:

- Surface Impoundments
- Waste Piles
- Land Treatment Units
- Landfills
- Ground-Water Protection

The format for elements of Sections 5.0 through 9.0 is as follows:

- Statement of the Federal permitting requirement as it appears in Part 270, and the corresponding Part 264 standard;
- Guidance to achieve the Part 264 standard drawn from the preamble to the Part 264 regulations published on July 26, 1982, and from the RCRA Technical Guidance Documents and other guidance manuals supplementing these regulations; and

- Detailed guidance to address the application information requirement. This includes a step by step explanation of what data should be presented for each information requirement, and how these data should be presented.
- List of references helpful in resolving technical and administrative questions
- Checklist of general and specific requirements for permit applications. It is strongly recommended that applicants use the checklists to insure that all application requirements are met.

SECTION 2.0

ADMINISTRATIVE PROCEDURES IN THE PERMITTING PROCESS

This section outlines the activities entailed in applying for and obtaining a RCRA permit for a hazardous waste management facility. An understanding of these procedures will enable applicants to expedite the permitting process.

Most facilities that treat, store, or dispose of hazardous waste on or in the land must obtain a RCRA permit. Facilities subject to all the Part 264 and 270 requirements and discussed in this manual are surface impoundments, waste piles, land treatment units, and landfills. Other types of facilities are governed by other regulations. These include storage and treatment in tanks and containers and treatment by incineration. If your situation involves only one of these other facilities, contact the EPA Regional Office personnel for guidance regarding permits. Further discussion of facility types and regulations is presented in Section 3.0.

For the four types of facilities discussed in this manual, the application for a RCRA permit consists of two parts, Part A and Part B. Owners and operators of certain facilities (i.e., those in existence before November 19, 1980), were required to submit Part A application by November 19, 1980, upon which they automatically gained interim status that allows them to continue to operate the facility until final administrative action is taken on the Part B permit. In order to complete permit processing, owners or operators of facilities with interim status must submit a Part B application after notification from EPA. The EPA Regional Administrators are required to give at least six months notice to owners and operators of existing, interim status, facilities as to when the Part B application is due. Until the final RCRA permit (Part B permit) is granted, compliance with Part 265 regulations is required under the conditions of interim status.

Owners and operators of new facilities must submit both Part A and Part B at least 180 days before the planned initiation of physical construction. Construction cannot commence until a permit is issued.

2.1 COORDINATION WITH STATES

An applicant for a RCRA permit should be aware that the EPA and the States generally share responsibilities for the administration of the RCRA permit program. Each State's role in the permitting process varies according to the status of its authorization to administer the Federal hazardous waste permit program. Applicants should familiarize themselves with the State's permitting process and be aware that EPA permit writers will be communicating with the State Agency at appropriate stages in the permit process.

2.2 SUBMITTING RCRA PART A PERMIT APPLICATIONS

A RCRA Part A permit application must be filed for new facilities along with the Part B permit application. Information to be included in the Part A application is described in §270.10(d)

2.4 CLAIMS OF CONFIDENTIALITY

At the time of submittal, applicants for a RCRA permit may assert a claim of business confidentiality for proprietary information included in the application. General EPA regulations governing claims of confidentiality are found in Title 40 of the Code of Federal Regulations (40 CFR), Part 2. Specific provisions for claims of confidentiality submitted with permit applications are found in 40 CFR 270.12.

Under 40 CFR 2.201 (Definitions) "business information" means "...any information which pertains to the interest of any business, which was developed or acquired by that business, and (except where the context otherwise requires) which is possessed by EPA in recorded form".

"Reasons of business confidentiality" include "the concept of trade secrecy and other related legal concepts which give (or may give) a business the right to preserve the confidentiality of business information and to limit its use or disclosure by others in order that the business may obtain or retain business advantages it derives from its rights in the information".

Applicants should limit their requests for confidential treatment to such material that, if released, is likely to cause substantial harm to the competitive position of their respective companies. Claims of confidentiality should not be asserted for information that is reasonably obtainable without the applicant's consent (for example, standard engineering designs). A claim of confidentiality for the entire permit application is likely not justifiable and such claims may be rejected.

enforcement action by the Agency or to termination of interim status through permit denial.

The Agency strongly recommends that the applicant contact the EPA Regional Office in the early stages of preparing the application to ensure a clear understanding of what information is required. The Agency will schedule a combined inspection and permit writer visit to the facility shortly after the Part B application is requested. Consultants or staff responsible for application preparation should participate in these joint meetings and visits. These will be opportunities to discuss application requirements and improvements necessary for the facility to be permitted. Depending on the depth and complexity of the issues, the EPA or the applicant may find it useful to schedule conferences or periodic meetings. These preliminary contacts can facilitate the permitting process by identifying problems early and enabling the applicant to resolve them.

Applicants should pay particular attention to their status (e.g., detection or compliance monitoring or corrective action) under the ground-water protection standards at an early stage in the permitting process. Applicants will be advised, at the time of the combined inspection and permit writer visit, of the ground water information required in the permit application. Applications subsequently received which are lacking the necessary information will be referred for enforcement. The Introduction to the Ground-Water Protection section of Section 9.0 describes several important ground-water considerations.

and §270.13. Forms used for Part A applications are included in Appendix A. Instructions for completing the Part A application are printed on the forms. The remainder of this manual generally applies only to Part B applications.

2.3 SUBMITTING RCRA PART B PERMIT APPLICATIONS

Applicants should contact their EPA Regional Offices to obtain the forms and other applicable information prior to completing the permit applications. These include:

- Part A application forms (see Section 4.0 and Appendix A)
- Copy of Part 264 and Part 270 regulations
- Notice of applicants' right to claim confidentiality
- Notice of right to question EPA Regional staff about application requirements
- Names and phone numbers of appropriate contacts including State authorities
- Information on the number of copies of the applications required and location where application should be filed.

The EPA Regional Office may request submission of Part B of the RCRA permit application from an existing interim status facility, or such a facility may voluntarily submit Part B at any time. The letter of request will generally include a list of the items in Part B that pertain to the permit applicant's facility type and the above information. This letter will include a due date for the Part B permit application. Owners and operators of interim status sites will be given at least six months from the date of the letter to the application due date. It is important that this due date be met. Failure to do so can lead to

Claims of confidentiality must be asserted when the permit application is submitted. If no claim is asserted at that time, the EPA may make the information available to the public without further notice to the applicant.

Prior to releasing any information for which a claim of confidentiality has been made, the Agency will give the applicant an opportunity to substantiate its claim, and will then determine whether the information warrants confidential treatment. If considered confidential by the Agency, information will not be released to the public under the Freedom of Information Act. To assert a claim, the applicant must attach a cover sheet to the information, or stamp or type a notice on each page of the information, or otherwise identify the confidential portions of the application. Words such as "trade secret", "confidential business information", "proprietary", or "company confidential" should be used. Such words of warning should be placed as hollow-letter stamps across the center of each applicable page. The notice should also state whether the applicant desires confidential treatment only until a certain date or a certain event.

The use of loose-leaf binders for permit applications is highly recommended. This format facilitates review and revision. If the loose-leaf format is used, confidential materials should be kept together in a separate binder(s), the cover of which is so identified. To aid in review, complete cross-reference notation should be included in the non-confidential portions of the applicaton to direct the reviewer to specific pages in the confidential binders. Likewise in the confidential binder(s), notation should be made as to the portions of the application to which each page or group of pages apply.

2.5 EPA'S REVIEW OF PART A AND PART B APPLICATIONS

When the EPA Regional Office receives a RCRA permit application, it reviews the application for administrative and technical completeness (see Figure 2-1). The completeness review takes 60 days for existing facilities and 30 days for new ones. If the application is incomplete, the EPA will request the missing information through a "Notice of Deficiency" (NOD) letter. This letter details the information needed to complete the application and specifies the date for submission of these data. The Agency will issue a warning letter to accompany the NOD requiring submission of the necessary information within a specified additional period of time. If the applicant receives a Notice of Deficiency and responds with additional information, each page of this response should fully identify the portion of the original application to which it applies. The checklists in Section 5.0 through 8.0 will be used for the completeness review. When the EPA has received all the necessary information, it will notify the applicant in writing that the application is complete.

The use of the loose-leaf format will aid in application review. Likewise, drawings should be either 8 1/2" x 11" and included in the binder(s) or standard size engineering drawings should be submitted. Engineering drawings (30" x 42" or equivalent) are preferred. Drawings should be identified by a unique

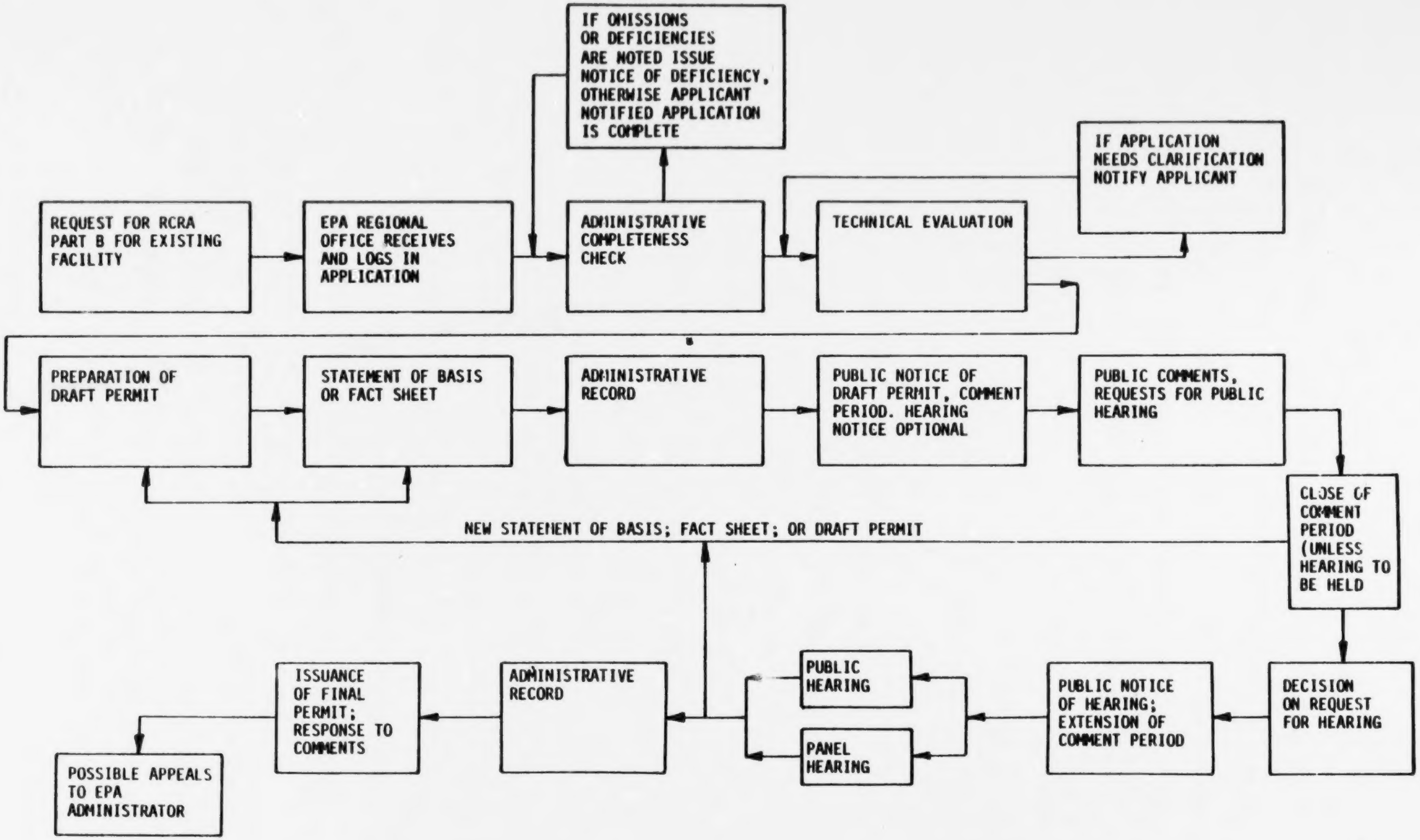

REQUEST FOR RCRA PART B FOR EXISTING FACILITY
EPA REGIONAL OFFICE RECEIVES AND LOGS IN APPLICATION
ADMINISTRATIVE COMPLETENESS CHECK
IF OMISSIONS OR DEFICIENCIES ARE NOTED ISSUE NOTICE OF DEFICIENCY, OTHERWISE APPLICANT NOTIFIED APPLICATION IS COMPLETE
TECHNICAL EVALUATION
IF APPLICATION NEEDS CLARIFICATION NOTIFY APPLICANT
PREPARATION OF DRAFT PERMIT
STATEMENT OF BASIS OR FACT SHEET
ADMINISTRATIVE RECORD
PUBLIC NOTICE OF DRAFT PERMIT, COMMENT PERIOD. HEARING NOTICE OPTIONAL
PUBLIC COMMENTS, REQUESTS FOR PUBLIC HEARING
CLOSE OF COMMENT PERIOD (UNLESS HEARING TO BE HELD
NEW STATEMENT OF BASIS; FACT SHEET; OR DRAFT PERMIT
DECISION ON REQUEST FOR HEARING
PUBLIC NOTICE OF HEARING; EXTENSION OF COMMENT PERIOD
PUBLIC HEARING
PANEL HEARING
ADMINISTRATIVE RECORD
ISSUANCE OF FINAL PERMIT; RESPONSE TO COMMENTS
POSSIBLE APPEALS TO EPA ADMINISTRATOR

Figure 2-1. Flow diagram of the RCRA permitting process.

drawing or sheet number; that number should be used in the text of the application when referring to the drawing.

The EPA then performs a technical review of the application to determine whether the facility has satisfied the requirements of the standards promulgated under Title 40 of the Code of Federal Regulations (40 CFR), Part 264, and should be granted a RCRA permit. A site inspection may be conducted during this technical review process to verify the information contained in the application. The technical review may generate the need for clarification from the applicant because the completeness review cannot identify and assess all detailed technical issues in the short time allowed.

The Agency may choose to use State officials or a contractor for technical expertise and assistance in reviewing permit applications or conducting on-site visits to verify information pertinent to the issuance or denial of a RCRA permit. EPA Headquarters has established Permit Assistance Teams composed of policy and technical specialists to assist personnel in the EPA Regional Offices. The purpose of these teams is to promote national policy consistency in the permit review process. The teams may be used to review permit applications.

2.6 DRAFT RCRA PERMITS AND PERMIT DENIALS

Upon completion of the technical review, the EPA Regional Administrator tentatively decides whether to issue or deny a RCRA permit. If the tentative decision is to issue the permit, the EPA regional staff prepares a draft permit for public review.

The draft RCRA permit specifies all the limitations, requirements, and conditions the facility must meet. The Regional Office also prepares a fact sheet or a statement of basis, which explains in simple language each condition included in the draft permit and the reasons for each condition.

When writing a RCRA permit, the EPA may specify a schedule for compliance (§270.33) at the time of permit issuance. A compliance schedule allows an existing facility to operate while the permittee upgrades the operations to meet all the regulatory requirements. In its decision regarding a schedule for compliance, the Agency also considers such factors as availability of any materials required to upgrade the facility, construction time, and the time required to contract for such services.

A permit may be denied for the following reasons.

- The facility cannot meet the requirements of the standards set forth in 40 CFR 264.
- Activities at the facility would endanger human health or the environment.
- An applicant is believed to have not fully disclosed all relevant facts in the application or during the RCRA permit issuance process.
- An applicant has misrepresented relevant facts at any time.
- The application did not fully meet the requirements of 40 CFR 270 (e.g. did not have the signature(s) of both the owner and the operator).

If the Regional Administrator tentatively decides to deny a RCRA permit, a notice of intent to deny a permit is prepared.

This notice is considered a type of draft permit and follows the same procedures as any draft permit. These procedures include preparation of a statement of basis or fact sheet containing reasons supporting the tentative decision to deny the permit, public notices of the denial, acceptance of comments, a possible hearing, preparation of a final decision, and possible receipt of a request for appeal.

2.7 PUBLIC NOTICE, COMMENTS, INFORMAL PUBLIC HEARINGS, PANEL HEARINGS

All draft RCRA permits are subject to public notice, public comments, and public hearing. Public notice provides interested persons a minimum of 45 days to comment on the draft permit. If written opposition to the Agency's intent to issue a permit and a request for a hearing are received during the comment period, a public hearing may be held. Notification of the hearing is issued at least 30 days prior to the scheduled date, and the public comment period is extended until the close of the public hearing.

2.8 FINAL PERMITS

After the close of the public comment period (which includes the public hearing period), the Regional Office either prepares and issues a final RCRA permit or denies the permit application. In either case, the applicant and those submitting questions and those requesting notification will be so notified, including information regarding appeal procedures. Final RCRA permits become effective 30 days after the date of the public notice of decision to issue a final permit unless a later date is specified in the permit or the conditions of §124.15(b) are met. At the time the final RCRA permit is issued, the Regional Office also issues a response to any significant public comments received and indicates any provisions of the draft permit that have been changed and the reasons for the changes. The response to comments becomes part of the administrative record.

2.9 APPEAL TO THE EPA ADMINISTRATOR

Persons who submitted comments on the draft RCRA permit or participated in any public hearing are allowed 30 days after the final permit decision to file a notice of appeal and a petition for review with the EPA Administrator in Washington, D.C., who will review and then grant or deny the petition within a reasonable time. If the Administrator decides to conduct a review, the parties are given the opportunity to file briefs in support of their positions. Within the 30 day period, the Administrator may, on his/her own motion, decide to review the decision to grant or deny a hearing. The Administrator then notifies the parties and schedules a hearing. On review, the Administrator has several options regarding the final decision. It may be summarily affirmed without opinion, modified, set aside, or remanded for further proceedings. This petition for review is a prerequisite for judicial review of the Administrator's final decision. Details of appeals of RCRA permit are found in §124.19.

SECTION 3.0

PERMITTING STANDARDS AND EPA GUIDANCE AND TECHNICAL MANUALS

This section discusses the facility and permitting standards related to land-based hazardous waste treatment, storage, and disposal facilities. It also contains lists and descriptions of documents developed by EPA to assist in the design and operation of such facilities and in the preparation of permit applications. Subsections are as follows:

- Section 3.1 provides a general look at Part 264 and 270 regulations.
- Section 3.2 provides assistance in determining if the wastes involved are hazardous and if the facility contemplated is land-based and thus included in this manual.
- Section 3.3 defines the types of land-based units assisting the applicant to identify the specific kind of unit(s) planned and the related facility and permit requirements.
- Section 3.4 provides titles, descriptions and sources of EPA documents helpful to permit applicants.

3.1 OVERVIEW OF PART 264 AND 270 REGULATIONS

3.1.1 General Applicability and Format

Subtitle C of the Resource Conservation and Recovery Act (RCRA) requires the Environmental Protection Agency (EPA) to establish a Federal hazardous waste management program. This program must ensure that hazardous wastes are handled safely from generation until final disposition.

Regulations related to hazardous wastes are initially published in the Federal Register. Subsequent references in this manual to the Federal Register will be of the form 47 FR 32353 which is Volume 47 of the Federal Register, page 32353. Publication date may also be shown. Federal Registers are available at law libraries, many major libraries, and at EPA Regional Offices. They may also be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. (202) 783-3238.

EPA has issued a series of hazardous waste regulations under Subtitle C of RCRA that are published in 40 Code of Federal. Regulations (CFR) Parts 260 to 271 and 122 to 124. Subsequent reference in this Manual to specific parts of 40 CFR will be of the form Part xxx. Reference to particular sections within a part will be shown as §264.19, which is Section 19 of Part 264. The applicant should have copies of those parts applicable to his situation. Copies are available at EPA Regional Offices.

The parts of 40 CFR related to hazardous wastes are:

Part 260 - Hazardous Waste Management System: General

Part 261 - Identification and Listing of Hazardous Wastes

Part 262 - Standards Applicable to Generators of Hazardous Wastes.

Part 263 - Standards Applicable to Transporters of Hazardous Wastes.

Part 264 - Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.

Part 265 - Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage,and Disposal Facilities.

Part 266 - Reserved.

Part 267 - Interim Standards for Owners and Operators of New Hazardous Waste Land Disposal Facilities.

Part 270 - EPA Administered Permit Programs: the National Pollutant Discharge Elimination System; the Hazardous Waste Permit Program; and the Underground Injection Control Program.

Part 271 - State Program Requirements.

Part 124 - Procedures for Decision-making.

Parts 264 and 265 contain standards applicable to owners and operators of all facilities (unless specifically exempted) that treat, store, or dispose of hazardous wastes. The Part 264 standards are implemented through permits issued by authorized States or the EPA in accordance with Part 270 and Part 124 regulations.

Until comprehensive standards could be established in Part 264, owners and operators of existing hazardous waste treatment, storage, and disposal facilities were allowed to apply for interim status under the requirements of Part 265. Permittees of such facilities are treated as having been issued a permit, until an authorized State or the EPA takes final administrative action on their permit applications using the permitting standards under Part 264. The Part 264 standards and the corresponding permitting procedures of Part 270 apply to both new and existing hazardous waste management facilities of all types, except as subsequently noted.

The Part 264 standards are made site-specific through the permit. The permit specifies the designs, operating procedures, hazardous constituent concentrations, and other factors that allow the facility to meet the Part 264 standards. With reference to a Federally-issued permit, the permit also provides a shield for the permittee. Compliance with the permit requirements is compliance with the Federal laws associated with hazardous waste management at the permitted facility. However, EPA may modify a permit if conditions at the facility change after the permit is issued or as otherwise noted in §270.41.

3.1.2 General Facility Standards

Part 264 is organized into several Subparts that deal with specific subjects or areas. This manual covers those Subparts that apply to hazardous waste land treatment, storage, and disposal facilities (i.e., surface impoundments, waste piles, land treatment units, and landfills).

Subparts A through E, G and H of Part 264 are described as the General Facility Standards, and are applicable to all hazardous waste management facilities.

- Subpart A - Presents the purpose, scope, and applicability (including exemptions) of Part 264.
- Subpart B - Delineates general procedures for facility operation, identification number, mandatory notice, waste analyses, location, security, inspections, and personnel training.
- Subpart C - Outlines the basic measures needed to prevent any unplanned release of hazardous wastes from the facility.
- Subpart D - Calls for preparation of a contingency plan with steps to be taken in an emergency.
- Subpart E - Specifies manifest, recordkeeping, and reporting requirements.

- **Subpart G** - Establishes closure and post-closure performance standards along with requirements for drawing up closure and post-closure care plans.

- Subpart H - Requires measures to ensure financial responsiblity for the life of the facility, including the post-closure care period.

The remaining Subparts of Part 264 contain standards for specific classes of facilities.

The EPA permitting process must include attention to §270.3 which concern consistency with other Federal laws. The following statutes are listed.

- Wild and Scenic Rivers Act
- National Historic Preservation Act of 1966
- Endangered Species Act
- Coastal Zone Management Act
- Fish and Wildlife Coordination Act

3.1.3 Ground-Water Protection

Ground-water protection has been one of EPA's central concerns in devising a regulatory strategy for hazardous waste land storage and disposal. The strategy developed by EPA for ground-water protection at land treatment, storage, and disposal facilities has two basic elements described in the preamble of 47 FR 32284. One element is a liquids management strategy for the disposal units at the facility that is intended to minimize leachate generation in the waste management units and to remove leachate from the waste management units before it enters the subsurface environment.

This is the first line of defense in the sense that it seeks to prevent ground-water contamination by controlling the source of the contamination. Performance standards for implementing this liquids management strategy are delineated for each type of land treatment, storage, and disposal unit under Subparts K-N of Part 264. The other element of the general strategy is a ground-water monitoring and response program that is designed to remove leachate from the ground water if it is detected. The monitoring and response program serves as a backup to the liquids management strategy. Performance standards for implementing the monitoring and response program are found in Subpart F of Part 264.

Subpart F establishes a three-stage program to detect, evaluate, and, if necessary, correct ground-water contamination caused by a waste management unit. The first stage is a detection monitoring program requiring the installation of wells (both up-and downgradient of the unit) to monitor the ground water for parameters that would indicate whether leachate is migrating from the unit. Data collected during a year of monitoring at the upgradient well(s) is used to determine the background level of constituents. Subsequent monitoring data at downgradient wells are then compared statistically to this background data of indicator parameters to ascertain whether contamination is present. If contamination is detected, analyses for all of the hazardous waste constituents on the list in Appendix VIII of Part 261 is required to identify those present in the ground water and to help establish concentration limits that then serve as part of the ground-water protection standard for the facility.

Once hazardous constituents are detected and their concentration limits set, the second stage, a compliance monitoring program is initiated. The purpose of this program is to monitor for the possibility that the concentrations of hazardous constituents may exceed the established concentration limits at the downgradient wells. For facilities seeking a permit in areas where ground water is already contaminated with hazardous constituents, this compliance monitoring program (or a corrective action program) would be used initially, instead of a detection monitoring program. The standard for satisfactory ground-water protection in these cases is generally "no increase above background level". Thus, a facility owner or operator would not be required to clean up contamination for which he was not responsible, but his facility must not contribute further to the level of ground-water contamination.

Alternate concentration limits (above background level) for a given hazardous constituent may be justified under some circumstances. Applicants desiring to establish alternative concentration limits for their facilities must fully justify the requested alternate limit.

Permitted concentrations limits may exceed background levels for 14 specific hazardous constituents without specific justification. These constituents and their respective maximum concentration levels (MCLs) are listed in Table 1 of §264.94. Permit applications must include a request for these levels if they are desired in lieu of background levels.

When the ground-water protection standard for a unit is violated, the third stage, a corrective action program, is initiated. This program must be designed to either remove waste constituents from the ground water, or treat (detoxify) them in place. Corrective action continues until compliance with the standard for that unit is achieved.

Subpart F of Part 264 applies to new and existing regulated units. A "regulated unit" is defined in §264.90(a) as any waste management unit (surface impoundment, waste pile, land treatment unit, or landfill) that receives hazardous waste after January 26, 1983, the effective date of this regulation. Waste management units that were receiving hazardous waste prior to this date, but that have not and will not receive any additional hazardous waste since January 26, 1983, are not required to meet the ground-water standards established in Subpart F. Some exclusions to Subpart F are provided for particular unit types with certain design features. Details of these features and a more complete discussion of ground-water protection are discussed in Section 9.0.

3.1.4 Specific Facility Standards

The primary element in EPA's regulatory strategy is to minimize migration of hazardous waste constituents from land management units into the environment. To a great extent, this can be accomplished by controlling liquids. The principal technical requirements to control liquids in each type of land management unit have been established under Subparts K-N of Part 264. As discussed in the preamble, 47 FR 32284, there are two avenues for controlling liquids. One is to minimize leachate generation by keeping liquids out of the unit, and the other is to prevent any liquids present in the unit from escaping into the surrounding environment. Technical requirements vary depending on the unit type, but they fall into a few general categories as noted in the preamble to (47 FR 32284). To avoid the generation of leachate, the owner or operator of some types of units will be required to control run-on to the unit, to substantially restrict the placement of liquid waste or waste containing free liquids, or to place a cap on the unit at closure. To prevent the migration of liquids into the environment, the owner or operator may be required to place underliners below the waste, to install leachate collection and removal systems, to assure the structural integrity of any dikes used at the unit, to control run-off from the unit, to treat hazardous constituents, or to remove free liquids at closure. Specific technical performance standards for controlling liquids and the design and operating procedures capable of meeting these standards for each unit type are discussed in Sections 5.0 through 8.0 of this manual.

3.1.5 Permit Application Regulations

Procedures for issuing and modifying hazardous waste permits are contained in Parts 270 and 124. These procedures apply to permitting hazardous waste management facilities covered by the Part 264 technical standards. Part 270 specifies a two-part hazardous waste permit application, Part A and Part B. Forms for a Part A permit application are shown in Appendix A. A Part B permit application is more complex, detailed, and facility-specific. Development of a standard format for the Part B application is difficult. This manual provides an acceptable Part B outline format for land treatment, storage, and disposal facility applications. EPA technical resource and guidance manuals are available that present permit application formats for hazardous waste management practices other than land treatment, storage, and disposal.

Part 270 describes the EPA's hazardous waste permitting program. It is a renumbering of the program described previously in Part 122. Part 270 was introduced in 48 FR 14228. A cross-reference from Part 122 section numbers to the Part 270 numbers is included in Appendix B.

The permitting procedures in Parts 270 and 124 allow for changes to permits. As discussed in the preamble, 47 FR 32282, the ground-water protection program contains several types of requirements that may need to be specified or modified after the permit has been issued. In these cases, the Part 124 procedures will be used to modify the permit.

There are exceptions to the Part 270 and Part 264 requirements. The applicant should be cautious to not include more information than is needed. For example, existing portions of existing units do not require liners. Thus applications need not address these situations. To aid in this area, a matrix is included in each subsequent section identifying required and optional inclusions for permit applications. Separate matrices are provided for surface impoundments, waste piles, land treatment units, and landfills.

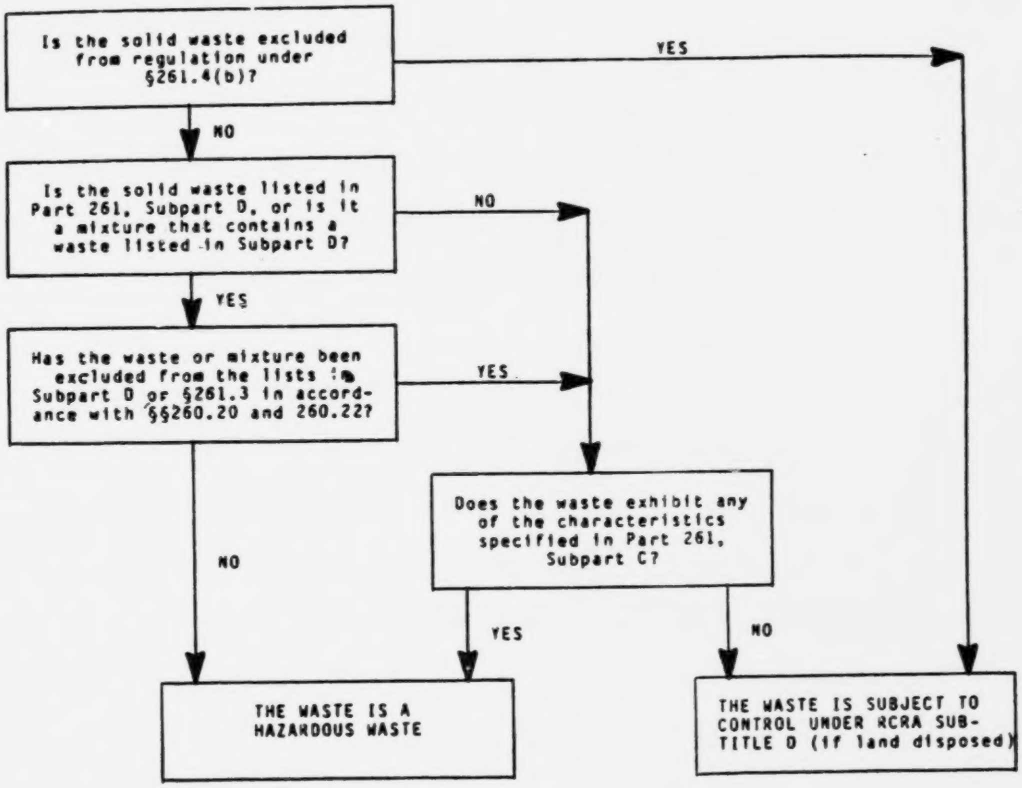
3.2 DETERMINING WHICH FACILITY STANDARDS APPLY

This section provides tests that the applicant can use to determine the applicability of this manual to his particular situation. The first test is the determination of whether or not the wastes involved are hazardous. If not, the wastes are not subject to RCRA Subtitle C. Rather, facilities at which these non-hazardous solid wastes are disposed are subject to applicable standards under RCRA Subtitle D.

If the wastes are hazardous, the applicant must confirm that the anticipated method(s) of waste management are land-based. Definitions are included for this assssment. If the method is land-based, this manual applies, if not, other publications will be helpful.

3.2.1 Hazardous Waste Confirmation

The first step in determining which RCRA standards apply to a particular facility is a confirmation that the facility handles "hazardous waste" (and is thus subject to the RCRA Subtitle C standards). The applicant should review the definition of a hazardous waste provided in §261.3. Generally, a waste is a hazardous waste if it is listed (or contains a waste that is listed) in Part 261, Subpart D or if it exhibits any of the characteristics of a hazardous waste described in Part 261, Subpart C. Certain solid wastes identified in §261.4(b), however, are specifically excluded from regulation as hazardous wastes. The flow chart below will assist in determining if a solid waste is hazardous.



Is the solid waste excluded from regulation under §261.4(b)?
YES
NO
Is the solid waste listed in Part 261, Subpart D, or is it a mixture that contains a waste listed in Subpart D?
NO
YES
Has the waste or mixture been excluded from the lists in Subpart D or §261.3 in accordance with §§260.20 and 260.22?
YES
NO
Does the waste exhibit any of the characteristics specified in Part 261, Subpart C?
YES
NO
THE WASTE IS A HAZARDOUS WASTE
THE WASTE IS SUBJECT TO CONTROL UNDER RCRA SUBTITLE D (if land disposed)

Moreover, certain hazardous wastes are subject to special requirements as defined in §261.5, §261.6, and §261.7. These sections apply to hazardous wastes that are (1) generated by small quantity generators, (2) used, reused, recycled or reclaimed, or

(3) present only as residues in empty containers, respectively. The applicant should consult these sections if he believes that the hazardous waste handled may be subject to these special requirements.

It is important to point out that leachate from a hazardous waste management unit is assumed to be a hazardous waste under §261.3(c)(2) unless the permittee proves otherwise. Precipitation run-off from a hazardous waste management unit is not assumed to be hazardous; however, if the run-off meets the criteria of a hazardous waste defined in Part 261, or has mixed with leachate it must be handled as a hazardous waste.

3.2.2 Determining if the Facility is a Land Treatment, Storage or Disposal Facility Subject to All the Part 264 and Part 270 Requirements

3.2.2.1 General Applicability of Parts 264 and 270 --

The applicant should confirm that the facility is not excluded from regulation under Part 264 or Part 270. Part 264 is applicable to owners and operators of all (existing and new) facilities that treat, store, or dispose of hazardous waste, except as specifically exempted in Part 264 or Part 261. The Part 261 exemptions are discussed above (see Section 3.1). Section 264.1 provides several exemptions that are applicable to land treatment, storage or disposal facilities. These include special exemptions for (1) owners or operators of publically-owned treatment works [§264.1 (e)], (2) persons who treat, store, or dispose of hazardous waste in an "authorized" State [§264.1(f)], (3) owners or operators handling hazardous wastes excluded under §261.5 and §261.6

[§264.1 (g)], (4) generators accumulating waste in tanks or containers on site for 90 days or less in compliance with §264.34 [§264.1(g)], and (5) farmers disposing of waste pesticides from their own use in compliance with §262.51 [§264.1(g)]. Any applicant who believes the facility may qualify for any of the above exemptions or any of the other exemptions listed in §264.1, should refer to the applicable Part 264 section or contact the Regional Office.

3.2.2.2 Facility Type Determination --

After it is confirmed that the handled waste is hazardous the applicant should determine if the facility is a land treatment, storage or disposal facility. A land treatment, storage or disposal facility is a facility containing one or more units in which hazardous waste is placed in or on the land for the purpose of treatment, or storage, or disposal, and which is supported by or constructed primarily of earthen materials. Land-based facilities may (and probably will) include some synthetic materials such as liners and leachate collection pipes. These facilities may include one or more of the following units: surface impoundments, waste piles, land treatment units, landfills, and underground injection wells. Although each of these units differ in its objective, design, and operation, each utilizes the land as an integral part of unit design and/or operation. For example, the land forms the basic structural support for landfills, surface impoundments, waste piles, and underground injection wells. In land treatment units, the land provides not only the design components, but also comprises the treatment capability of the system.

Certain land treatment, storage, or disposal facilities are also exempt from the Part 270 permitting requirements. These exemptions are defined in §270.1.

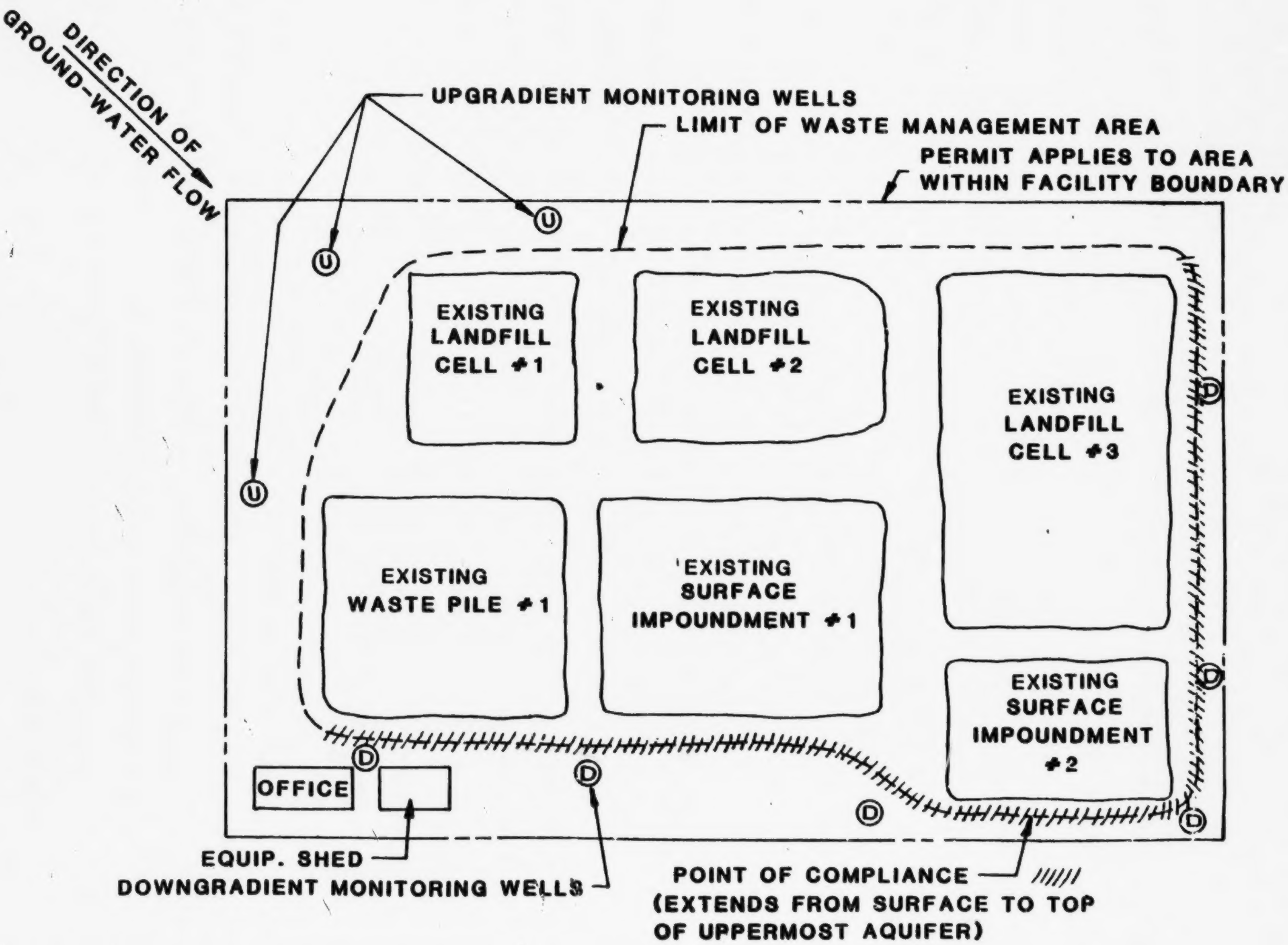
Tanks (above or below ground), containers, incinerators, and hazardous wastewater treatment systems are not considered to be land treatment, storage or disposal units. Unlike the above units, these are constructed primarily of non-earthen materials which provide structural support. In addition, hazardous waste is not placed in or on the land.

3.2.2.3 Relationship to Interim Status Standards --

Section 264.3 states that a facility owner or operator who has fully complied with the requirements for interim status (i.e., an existing facility covered under the Interim Status Standards specified in §270.71 and Part 265) must comply with the regulations specified in Part 265 in lieu of the regulations in Part 264, until final administrative disposition of his permit application is made. Therefore interim status facilities will continue to follow the Part 265 regulations until they are issued a Part 264 permit.

3.2.3 Terminology Associated with Facilities

Terminology used in this manual is generally consistent with that used in Parts 264 and 270. Hazardous waste management facilities include a waste management area(s) and areas not directly related to waste management such as buffer areas, offices, and equipment sheds. The following terms are illustrated in Figure 3-1.


DIRECTION OF
GROUND-WATER FLOW
UPGRADIENT MONITORING WELLS
LIMIT OF WASTE MANAGEMENT AREA
PERMIT APPLIES TO AREA
WITHIN FACILITY BOUNDARY
U
U
U
EXISTING
LANDFILL
CELL #1
EXISTING
LANDFILL
CELL #2
EXISTING
LANDFILL
CELL #3
EXISTING
WASTE PILE #1
EXISTING
SURFACE
IMPOUNDMENT #1
EXISTING
SURFACE
IMPOUNDMENT
#2
D
D
D
D
D
D
OFFICE
EQUIP. SHED
DOWNGRADIENT MONITORING WELLS
POINT OF COMPLIANCE //////
(EXTENDS FROM SURFACE TO TOP
OF UPPERMOST AQUIFER)

GENERALIZED HAZARDOUS WASTE MANAGEMENT FACILITY WITH SIX-UNITS (NO SCALE)

The "waste management area" is described by the collection of "regulated units" at the facility. A regulated unit is any "waste management unit" that has or will receive hazardous wastes after January 26, 1983 (the effective date of the Part 264 Land Disposal Permitting Standards). A waste management unit is generally synonymous with a surface impoundment, waste pile, land treatment unit, or landfill cell. It is a contiguous area of land on or in which waste is placed. Landfills may present an exception to this general rule. A landfill can be designed as a collection of separately lined trenches with each individual trench considered to be a separate waste management unit. A waste management unit can be a regulated unit even though it contains predominantly non-hazardous waste or hazardous waste which was disposed prior to January 26, 1983.

The waste management area is made up of one or more waste management units that have received hazardous wastes after January 26, 1983 (i.e., regulated units). The waste management area is the area on which waste will be placed during the active life of the regulated unit. It includes any horizontal space taken up by barriers, such as dikes, designed to contain waste. Where there are more than one regulatd units, the waste management area is described by an imaginary line circumscribing these regulated units.

The "point of compliance" is a vertical surface located at the hydraulically downgradient limit of the waste management area, extending from the Earth's surface down into the uppermost aquifer.

The point of compliance is, in fact, a set of points (or surface). It is the location along which the Ground Water Protection Standard (see §264.92) must be met, and at which detection monitoring wells are located. The Regional Administrator will specify the location of the point of compliance in the permit after evaluation of the description of the waste management area and the nature of the hydrogeology of the site.

3.3 UNIT TYPES AND APPLICABLE STANDARDS

3.3.1 Types of Units

Once the applicant has determined that the proposed facility is a hazardous waste land treatment, storage, or disposal facility that is subject to the Part 264 and 270 standards, he should determine exactly what type of unit(s) is present at the facility. This determination is necessary in order to evaluate which specific Part 264 and 270 requirements apply, and to clearly identify the units to be included in the permit application.

The first step is the determination of whether the unit will be used for treatment, storage, or disposal. Treatment and storage units are considered to be temporary. After such units have served the purpose for which they were constructed, any remaining hazardous waste, liner or other contaminated material must either be decontaminated or removed and disposed at a permitted hazardous waste disposal site. If a permittee cannot decontaminate or remove hazardous wastes from a treatment or storage unit, the unit must be managed as a disposal unit and evantually closed as such in accordance with the applicable regulations.

EPA can issue or deny a Part B permit to one or more units at an existing facility without affecting the interim status of any remaining units for which a final permit has not been issued or denied. EPA will normally permit all the hazardous waste units at a facility simultaneously, but there may be circumstances under which this would be impossible or undesirable. Section 270.41(a)(5) provides that any permit issued to a facility for less than all of the units at the facility may be modified to include conditions applicable to units that are permitted later.

The five common land treatment, storage or disposal unit types identified above include surface impoundments, waste piles, land treatment units, underground injection wells, and landfills. Surface impoundments may be further divided into three types: treatment, storage, and disposal. The characteristics of each of these common unit types as well as certain variants are discussed below.

3.3.1.1 Surface Impoundment

A surface impoundment is defined in §260.10 as "a facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid wastes or wastes containing free liquid, and which is not an injection well. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons." The Agency interprets this definition to mean that a surface impoundment will normally have a fluid surface, and will contain non-containerized bulk liquids.

Some basic requirements for surface impoundments are: a liner system; a design that prevents overtopping; and dikes that are designed, constructed, and maintained to prevent massive failure.

A disposal surface impoundment is an impoundment in which hazardous wastes or residues will remain after closure, while a storage impoundment is one in which hazardous wastes and residues are held for a temporary period and removed at closure. A treatment surface impoundment is one in which activity has taken place to modify the waste physically or chemically to render it less toxic, less mobile, or otherwise less hazardous (for purposes of regulation). It may be classified as either a storage (temporary) or a disposal (permanent) unit. According to the Part 264 standards, permittees of surface impoundments must, at closure, either remove or decontaminate all waste residues and soils (i.e., for storage impoundments), or solidify all remaining wastes and apply a final cover (i.e., for disposal impoundments).

3.3.1.3 Land Treatment Unit --

A land treatment unit is defined §260.10 as "a facility or part of a facility at which hazardous waste is applied onto or incorporated into the soil surface". As provided in Subpart M, Part 264, a waste must not be land treated unless the hazardous constituents in the waste can be degraded, transformed or immobilized in a treatment zone located above the ground-water table.

Therefore, treatment of hazardous constituents within the treatment zone must be the primary focus of a land treatment unit. Units designed primarily for the purpose of dewatering without treatment are not considered land treatment units; such units should be considered surface impoundments and evaluated as such.

In addition, land treatment units are dissimilar to other land disposal units in that they are not designed and operated to minimize liquid release to ground water (e.g., through the use of liners). On the contrary, they are open systems that allow liquids to move out of the unit. Control of the moisture content within the treatment zone is essential to maintain adequate treatment. Units for which the design and operation do not allow for this may be more appropriately evaluated as surface impoundments.

3.3.1.3 Waste Piles --

A waste pile is defined in §260.10 as "any non-containerized accumulation of solid, nonflowing hazardous waste that is used for treatment or storage." Waste piles may not be used to intentionally dispose of wastes. If the permittee of a pile wishes to dispose of wastes, he must apply for a landfill permit and manage the pile as a landfill. Waste piles are generally small, and many are in buildings or maintained outside on concrete or other pads. They are frequently used to accumulate waste before shipment, treatment, or disposal, and are typically composed of a single, dry material. The basic requirements (in the Part 264 regulations) for waste piles are: (1) a liner to prevent migration of wastes out of the pile during the pile's active life (with an exemption for existing portions); (2) leachate collection and removal; (3) control of run-on and run-off; and (4) removal of wastes at closure.

3.3.1.4 Underground Injection Unit --

Underground injection is defined in §260.10 as "the subsurface emplacement of fluids through a bored, drilled, or driven well, or through a dug well, where the depth of the dug well is greater than the largest surface dimension." Injection well means a well into which fluids are injected. Septic tanks or cesspools used to dispose of hazardous waste have been specifically included in the definition of injection well (See §144.1).

Underground injection wells are regulated under both RCRA and the Safe Drinking Water Act (through the Underground Injection Control (UIC) Program). EPA intends to continue the RCRA Part 267 requirements and the Part 265 interim status standards for injection wells only until each State implements its own UIC program or one is implemented for it by EPA under the Safe Drinking Water Act. Underground injection wells are not regulated under Part 264. Thus, they will not be addressed in this manual.

3.3.1.5 Landfill --

A landfill is defined in §260.10 as "a disposal facility or part of a facility where hazardous waste is placed in or on land and which is not a land treatment unit, surface impoundment, or an injection well". Landfills can be readily differentiated from land treatment units, waste piles and injection wells using the descriptions provided above. However, differentiating between landfills and surface impoundments may be difficult in certain cases. Although surface impoundments are designed intentionally to hold liquid wastes, landfills may also accept bulk liquids under certain conditions. Section 264.314 currently states that bulk or non-containerized liquid waste or waste containing free liquids must not be placed in a landfill unless: (1) the landfill has a liner and leachate collection and removal system that meet the requirements of §264.301(a), or (2) before disposal, the liquid waste is solidified. Therefore, distinguishing between a landfill and surface impoundment based on types of waste may be difficult in certain cases.

However, a determination can be made based on design distinctions. First, new (or new portions of) landfills must have leachate collection and removal systems. This requirement does not apply to surface impoundments, or to existing portions of a landfill. Second, the liner requirements differ somewhat for certain types of new (or new portions of) surface impoundments and landfills. (The liner requirements do not apply to existing portions of surface impoundments and landfills). Disposal units (all landfills and designated surface impoundments) where wastes remain at closure must have impermeable (no migration of waste constituents into or through the liner material) liners. Given the state of current liner technology, synthetic liners are the only common type that qualify as impermeable in the evaluation of permit applications. Storage surface impoundments where wastes (including contaminated liners) are removed at closure may use liner materials that allow waste constituents to migrate into, but not through, the liner itself. Clays or compacted soils will often meet this requirement. New (and new portions of) landfills must comply with the leachate collection and removal standard which requires that the system be designed to achieve a maximum one-foot head of fluid above the liner. Such units would not have a fluid surface.

Differentiating between an existing portion of a landfill and an existing portion of a surface impoundment may, in rare circumstances, be difficult because such portions are exempt from both the liner and leachate collection and removal system requirements. If uncertain, the applicant should consult the EPA Regional Office in making this classification decision.

3.3.1.6 Seepage Facilities --

The new Part 264 standards do not incorporate the "seepage facilities" concept for which standards were proposed (but never promulgated) on February 5, 1981 (46 FR 11216). Seepage facilities are lagoons that are designed intentionally to leak. Depending upon design, they may also be considered as underground injection units or land treatment units. EPA has concluded that land disposal facilities should be designed not to leak at all during their active lives, except in rare cases (see §264.221(b)). Therefore, impoundments must be lined in accordance with these standards, and new and existing land treatment units must prevent release of hazardous constituents by treating them within the treatment zone. Thus, new and existing seepage facilities (other than existing portions of surface impoundments that may comply with the Subpart F ground-water protection requirements and other applicable requirements) cannot be permitted under these regulations.

3.3.1.7 Undefined Unit Types --

It is possible that some hazardous waste land treatment, storage or disposal practice is currently used, or may be developed in the future, that does not fit the description of any of the above units. EPA is considering promulgating regulations in a separate Subpart to address waste management units that are covered generally, but do not fit precisely into any of the existing categories. Such regulations will probably include general environmental performance standards similar to those contained in §267.10.

3.3.1.8 Monofills

Monofills are generally considered to be landfills, surface impoundments, or waste piles used to treat, store or dispose of one or more of a small group of inorganic wastes. The Agency has not developed a formal definition of monofills. Additional action regarding monofills depends on the content of RCRA reauthorization legislation. Any regulations associated with monofills should not be anticipated until four years subsequent to RCRA reauthorization.

3.3.2 Standards Applicable to Specific Unit Types

3.3.2.1 Important Definitions: "Existing" and "New" Hazardous Waste Management Facilities, "Existing Portion", "Regulated Unit" --

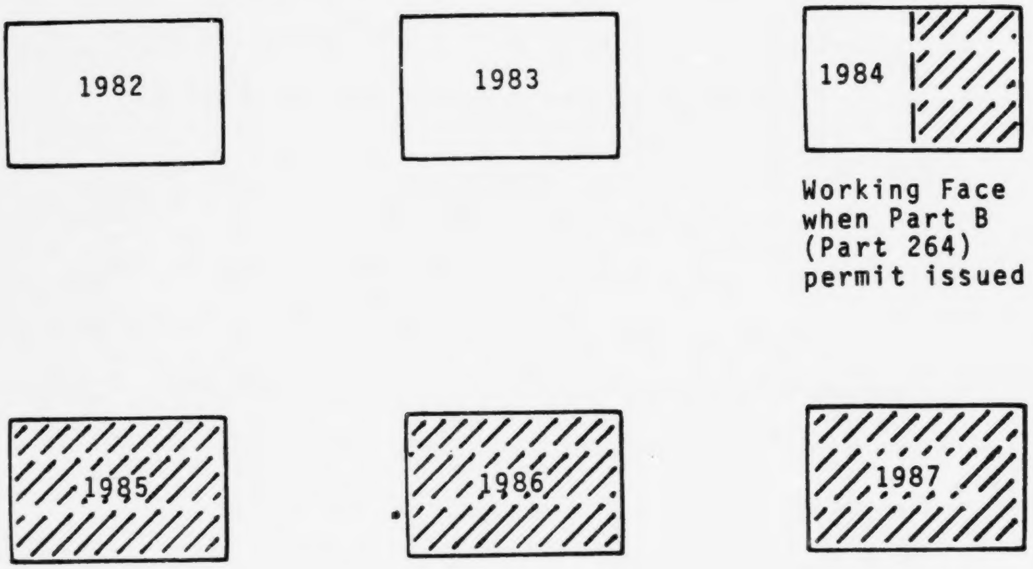
There are several definitions that will be important in determining which standards are applicable to a specific unit. These include "existing" and "new" hazardous waste management facilities, "existing portion" of an existing unit, and "regulated unit". The applicant should evaluate whether the facility contains existing or new units, whether the units within the facility are "regulated units", and if the existing units contain "existing portions".

An existing hazardous waste management facility means a facility which was in operation or for which construction commenced on or before November 19, 1980. A facility commenced construction on or before November 19, 1980, if: (1) the owner or operator obtained the Federal, State, and local approvals or permits necessary to begin physical construction by that date; and (2) a continuous on-site, physical construction program was begun by that date, or the owner or operator entered into contractual obligations, which cannot be cancelled or modified without substantial loss, for physical construction of the facility to be completed within a reasonable time. Any facilities that do not meet these criteria for existing facilities are considered new facilities. (Existing facilities must comply with the Interim Status Standards (Part 265) while they await issuance of the Part 264 Permit.) Although the Part 264 standards apply to both new and existing facilities, some of the information requirements provided in Part 270 differentiate between new and existing facilities.

An existing facility may contain existing and new units. A unit is an identifiable area in which only one type of land-based hazardous waste management takes place (e.g., an individual surface impoundment or a trench at a landfill). An existing unit is one which is covered by the Interim Status requirements (see §265.1 and RCRA §3005(e).

The applicant should determine if any of the existing waste management units within the facility contain "existing portions". An existing portion is any land surface area of an existing waste management unit, included in the original Part A application, on which wastes have been placed prior to issuance of a Part B permit. For example, this may be one cell or trench or portion of a cell or trench of a landfill or a section of a pile. Figure 3-2 illustrat the concept of existing portions. It is important to note that the critical date is the date of permit issuance, not the effective date of the Part 264 regulations (January 26, 1983). In order to avoid retrofitting, existing portions of landfills, surface impoundments, and waste piles are exempt from the requirements to install liners and leachate collection systems. New units (units not included in the original Part A application) of existing facilti are not entitled to the exemption; they would not experience the retrofitting problems pertaining to existing portions.

The term "regulated unit" is used in defining the portion of the facility that is subject to the ground-water monitoring and


1982
1983
1984
Working Face
when Part B
(Part 264)
permit issued
1985
1986
1987

Legend:

☐ Existing portions, thus exempt from liner standards and leachate collection system

▨ New portions subject to standards

Figure 3-2. Concept of existing portions of hazardous waste management units.

response requirements provided in Subpart F. A regulated unit is any waste management unit of the types described in Section 3.2.3.1 above that received hazardous waste after January 26, 1983, the effective date of the Part 264 regulations (see §264.90). The Preamble to the Part 264 land disposal regulations provides additional rationale for requiring ground-water monitoring at regulated units (See 47 FR 32274).

Because of its definition, the term "regulated unit" not only defines what facility portions will be subject to Subpart F, but it also indirectly delineates those portions of the facility that will be actively operating under a Part 264 permit. Facility portions that do not receive wastes after January 26, 1983 (i.e., are not regulated units), must be closed or in the process of closing. Otherwise, EPA assumes that the unit will receive hazardous waste at some future time, thereby establishing the unit as a regulated unit.

3.3.2.2 Standards Applicable to All Units --

The Part 264 and 270 regulations contain requirements in certain Subparts that are generally applicable to all land treatment, storage, or disposal units (except those defined in §264.1 described above). These Part 264 requirements include the following:

- Subpart B - General Facility Standards;
- Subpart C - Preparedness and Prevention;
- Subpart D - Contingency Plan and Emergency Procedures;

- Subpart E - Manifest System, Recordkeeping and Reporting (certain sections are not applicable to owners and operators of on-site facilities that do not receive any hazardous waste from off-site sources).
- Subpart G - Closure and Post-Closure (the post-closure requirements do not apply to storage or treatment facilities).
- Subpart H - Financial Requirements (§264.144, §264.145 and §264.146 apply only to disposal facilities).

The Part 270 information requirements that correspond to the above general standards are provided in §270.14 - "General Information Requirements".

The ground-water monitoring and response requirements, defined in Subpart F of Part 264, also apply to all land treatment, storage, or disposal units - with several notable exceptions. First, as with the above requirements, any of the general exclusions in §264.1 exempt certain facilities from Subpart F as well.

Second, double-lined surface impoundments, waste piles, and landfills (described in §264.222, §264.252, and §264.302, respectively) are excluded as are waste piles complying with §264.250(c) and §264.253. The reason that most of these provisions provide a basis for an exclusion from Subpart F is that they involve some ongoing method for detecting whether the unit's liner has failed. The exclusion for a waste pile designed to satisfy §264.250(c) is based on the premise that the specified conditions reduce the possibility of leachate generation to such a degree that ground-water contamination is not likely to occur.

Third, the permittee of a land treatment unit may suspend compliance with Subpart F requirements if he can demonstrate to the Regional Administrator under §264.280(d) that the hazardous constituents in the waste have been effectively treated. This exclusion relieves the permittee from Subpart F responsibilities only during the post-closure care period.

Fourth, the permittee of a regulated unit may be excluded from Subpart F if the Regional Administrator finds that there is no potential for migration of liquids from the regulated unit to the uppermost aquifer during the active life of the unit (including the closure period) and the post-closure care period specified under §264.117. This exclusion is designed for units located in hydrogeologic settings that prevent leachate migration to the uppermost aquifer for very long periods. The flowcharts described in Section 3.3.2.3 below will assist the applicant in defining the applicability of Subpart F to his particular unit.

The Part 270 information requirements corresponding to the Subpart F, Part 264 ground-water standards are provided in §270.14(c) - Additional Information Requirements.

3.3.2.3 Specific Unit Standards --

In addition to the above described general requirements applicable (generally) to all unit types, Part 264 and 270 contain specific requirements applicable to specific land treatment, storage, or disposal unit types. These requirements are written in Part 264 Subpart K (Surface Impoundments), Subpart L (Waste Piles), Subpart M (Land Treatment Units), and Subpart N (Landfills). The corresponding Part 270 information requirements are defined in §270.15-270.21 - Specific Information Requirements.

To assist the applicant in integrating all facility and unit information (e.g., regarding existing portions, etc.) and determining the requirements that apply to his specific unit, flowcharts are presented for each unit type (Figures 3-3 through 3-7). These charts will assist in making the decisions essential in arriving at a clear understanding of the specific requirements that apply in a particular situation. (Note: In addition to the specific requirements defined in the figures, all permittees must comply with the general Subpart provisions delineated in Section 3.2.4.2 above.)

3.4 RCRA TECHNICAL GUIDANCE DOCUMENTS, TECHNICAL RESOURCE DOCUMENTS, AND OTHER GUIDANCE MANUALS

To assist permit applicants and permit writers, EPA has prepared several publications related to land-based hazardous waste management units. The following publications contain guidance regarding the design of specific aspects of units, provide general guidance regarding operations, and discuss diverse topics such as test methods and financial assurance.

3.4.1 RCRA Technical Guidance Documents

3.4.1.1 List --

Four Technical Guidance Documents (TGDs) are being made available that are directly related to the Part 264 regulations for land

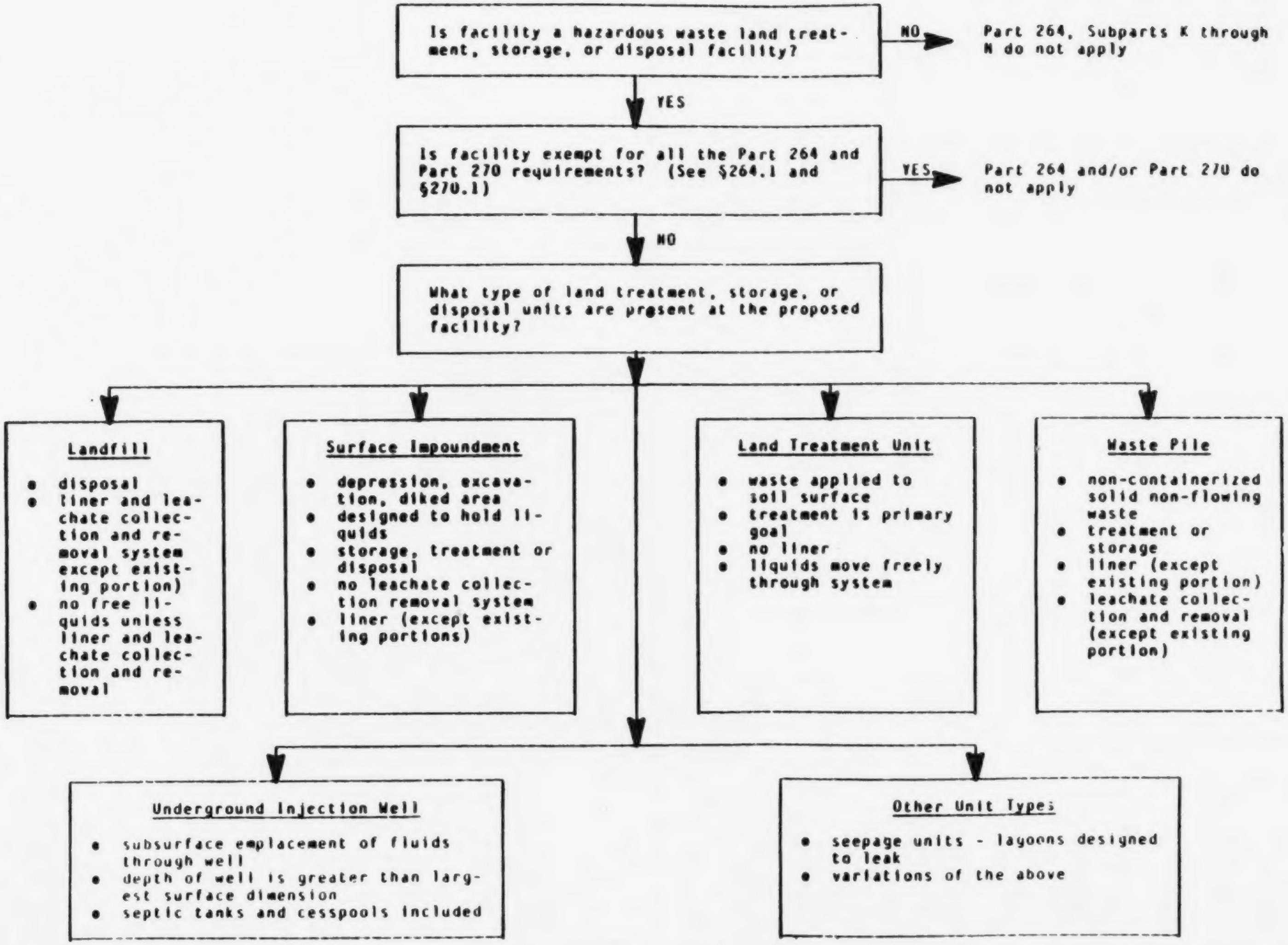

Is facility a hazardous waste land treatment, storage, or disposal facility?
NO
Part 264, Subparts K through N do not apply
YES
Is facility exempt for all the Part 264 and Part 270 requirements? (See §264.1 and §270.1)
YES
Part 264 and/or Part 270 do not apply
NO
What type of land treatment, storage, or disposal units are present at the proposed facility?
Landfill
• disposal
• liner and leachate collection and removal system except existing portion)
• no free liquids unless liner and leachate collection and removal
Surface Impoundment
• depression, excavation, diked area
• designed to hold liquids
• storage, treatment or disposal
• no leachate collection removal system
• liner (except existing portions)
Land Treatment Unit
• waste applied to soil surface
• treatment is primary goal
• no liner
• liquids move freely through system
Waste Pile
• non-containerized solid non-flowing waste
• treatment or storage
• liner (except existing portion)
• leachate collection and removal (except existing portion)
Underground Injection Well
• subsurface emplacement of fluids through well
• depth of well is greater than largest surface dimension
• septic tanks and cesspools included
Other Unit Types
• seepage units - lagoons designed to leak
• variations of the above

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Figure 3-3. Determining Facility and unit type.

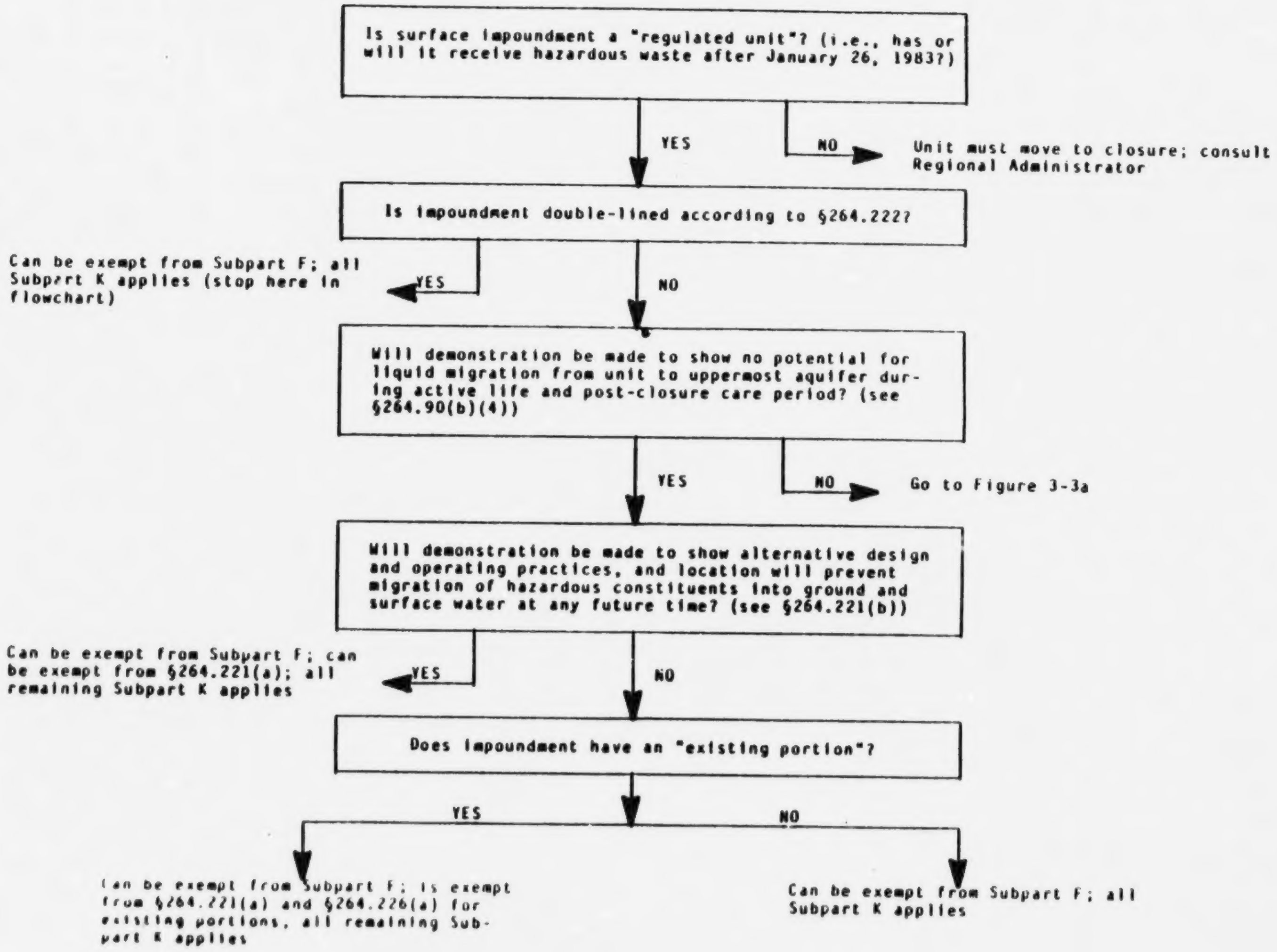
Is surface impoundment a "regulated unit"? (i.e., has or will it receive hazardous waste after January 26, 1983?)
YES
NO
Unit must move to closure; consult Regional Administrator
Is impoundment double-lined according to §264.222?
YES
Can be exempt from Subpart F; all Subpart K applies (stop here in flowchart)
NO
Will demonstration be made to show no potential for liquid migration from unit to uppermost aquifer during active life and post-closure care period? (see §264.90(b)(4))
YES
NO
Go to Figure 3-3a
Will demonstration be made to show alternative design and operating practices, and location will prevent migration of hazardous constituents into ground and surface water at any future time? (see §264.221(b))
YES
Can be exempt from Subpart F; can be exempt from §264.221(a); all remaining Subpart K applies
NO
Does impoundment have an "existing portion"?
YES
Can be exempt from Subpart F; is exempt from §264.221(a) and §264.226(a) for existing portions, all remaining Subpart K applies
NO
Can be exempt from Subpart F; all Subpart K applies

Figure 3-4. Subpart F and K requirements for surface impoundments.

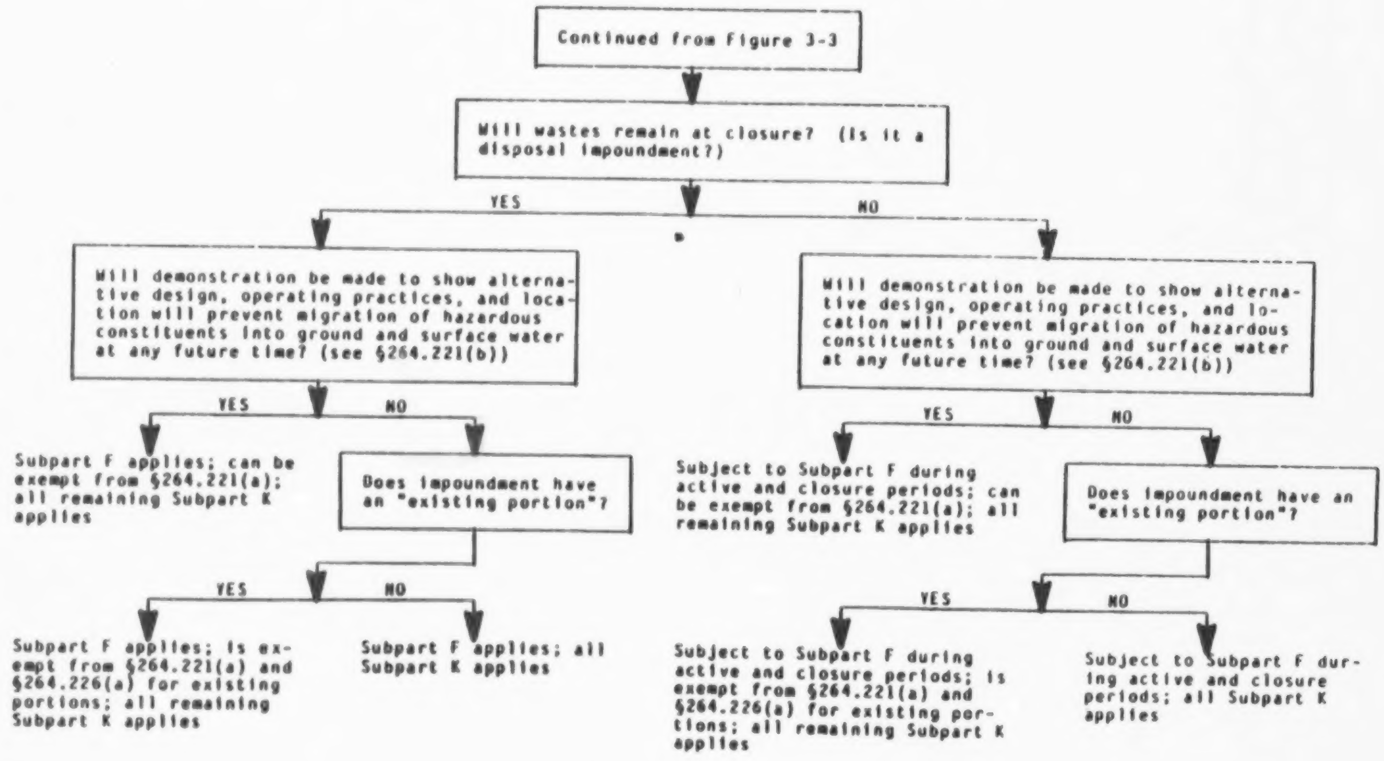
Continued from Figure 3-3
Will wastes remain at closure? (Is it a disposal impoundment?)
YES
NO
Will demonstration be made to show alternative design, operating practices, and location will prevent migration of hazardous constituents into ground and surface water at any future time? (see §264.221(b))
YES
NO
Subpart F applies; can be exempt from §264.221(a); all remaining Subpart K applies
Does impoundment have an "existing portion"?
YES
NO
Subpart F applies; is exempt from §264.221(a) and §264.226(a) for existing portions; all remaining Subpart K applies
Subpart F applies; all Subpart K applies
Will demonstration be made to show alternative design, operating practices, and location will prevent migration of hazardous constituents into ground and surface water at any future time? (see §264.221(b))
YES
NO
Subject to Subpart F during active and closure periods; can be exempt from §264.221(a); all remaining Subpart K applies
Does impoundment have an "existing portion"?
YES
NO
Subject to Subpart F during active and closure periods; is exempt from §264.221(a) and §264.226(a) for existing portions; all remaining Subpart K applies
Subject to Subpart F during active and closure periods; all Subpart K applies

Figure 3-4A. Subpart F and K requirements for surface impoundments (continued from Figure 3-33).

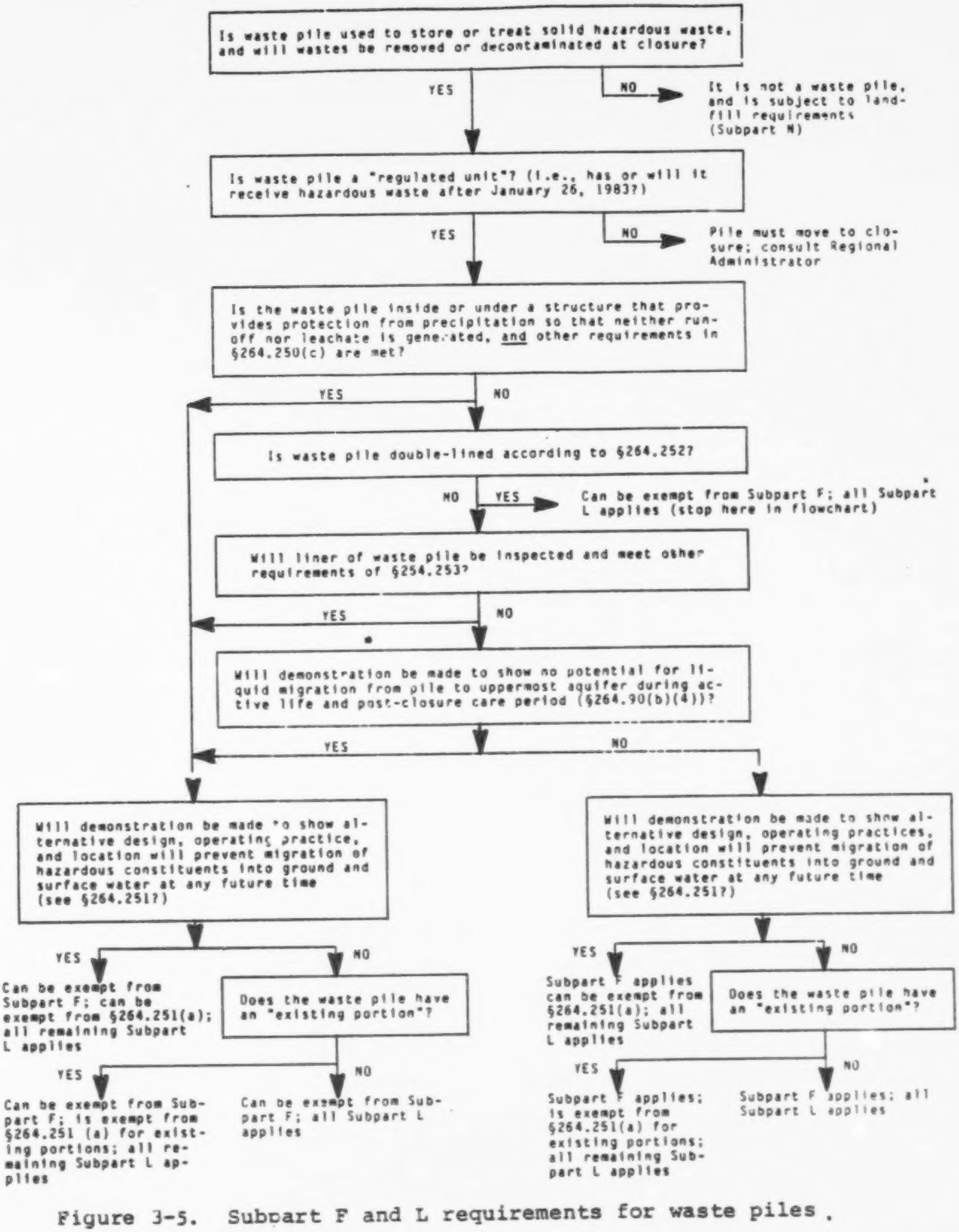
Is waste pile used to store or treat solid hazardous waste, and will wastes be removed or decontaminated at closure?
YES
NO
It is not a waste pile, and is subject to landfill requirements (Subpart N)
Is waste pile a "regulated unit"? (i.e., has or will it receive hazardous waste after January 26, 1983?)
YES
NO
Pile must move to closure; consult Regional Administrator
Is the waste pile inside or under a structure that provides protection from precipitation so that neither run-off nor leachate is generated, and other requirements in §264.250(c) are met?
YES
NO
Is waste pile double-lined according to §264.252?
NO
YES
Can be exempt from Subpart F; all Subpart L applies (stop here in flowchart)
Will liner of waste pile be inspected and meet other requirements of §254.253?
YES
NO
Will demonstration be made to show no potential for liquid migration from pile to uppermost aquifer during active life and post-closure care period (§264.90(b)(4))?
YES
NO
Will demonstration be made to show alternative design, operating practice, and location will prevent migration of hazardous constituents into ground and surface water at any future time (see §264.251?)
YES
NO
Can be exempt from Subpart F; can be exempt from §264.251(a); all remaining Subpart L applies
Does the waste pile have an "existing portion"?
YES
NO
Can be exempt from Subpart F; is exempt from §264.251 (a) for existing portions; all remaining Subpart L applies
Can be exempt from Subpart F; all Subpart L applies
Will demonstration be made to show alternative design, operating practices, and location will prevent migration of hazardous constituents into ground and surface water at any future time (see §264.251?)
YES
NO
Subpart F applies can be exempt from §264.251(a); all remaining Subpart L applies
Does the waste pile have an "existing portion"?
YES
NO
Subpart F applies; is exempt from §264.251(a) for existing portions; all remaining Subpart L applies
Subpart F applies; all Subpart L applies

Figure 3-5. Subpart F and L requirements for waste piles .

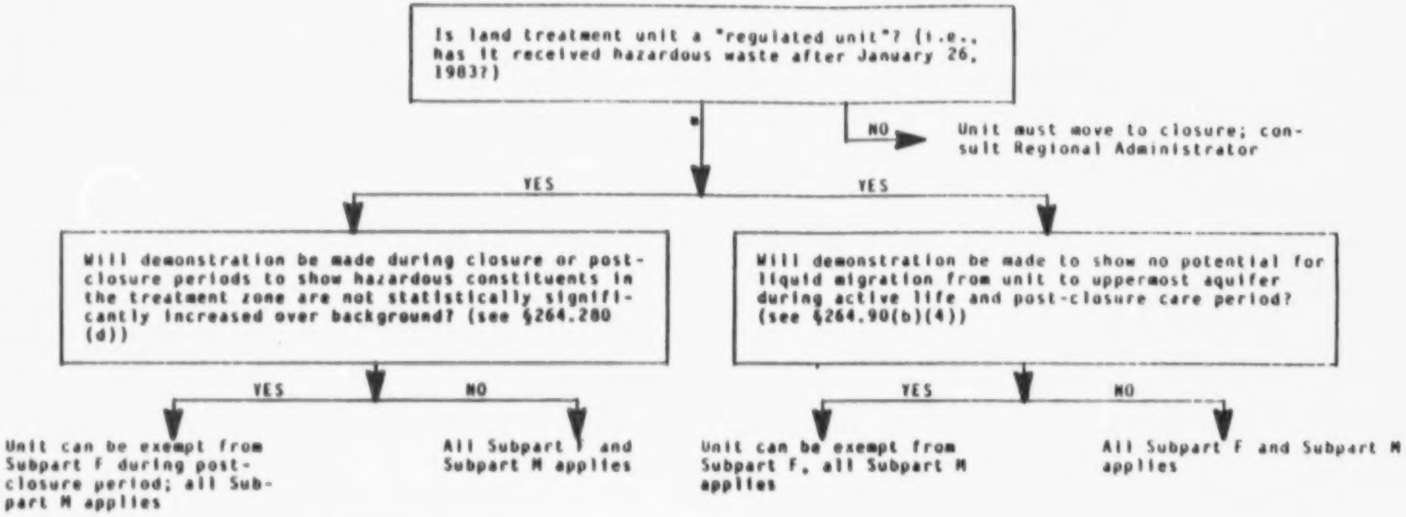
Is land treatment unit a "regulated unit"? (i.e., has it received hazardous waste after January 26, 1983?)
NO
Unit must move to closure; consult Regional Administrator
YES
YES
Will demonstration be made during closure or post-closure periods to show hazardous constituents in the treatment zone are not statistically significantly increased over background? (see §264.280 (d))
Will demonstration be made to show no potential for liquid migration from unit to uppermost aquifer during active life and post-closure care period? (see §264.90(b)(4))
YES
NO
YES
NO
Unit can be exempt from Subpart F during post-closure period; all Subpart M applies
All Subpart F and Subpart M applies
Unit can be exempt from Subpart F, all Subpart M applies
All Subpart F and Subpart M applies

Figure 3-6. Subpart F and M requirements for land treatment.

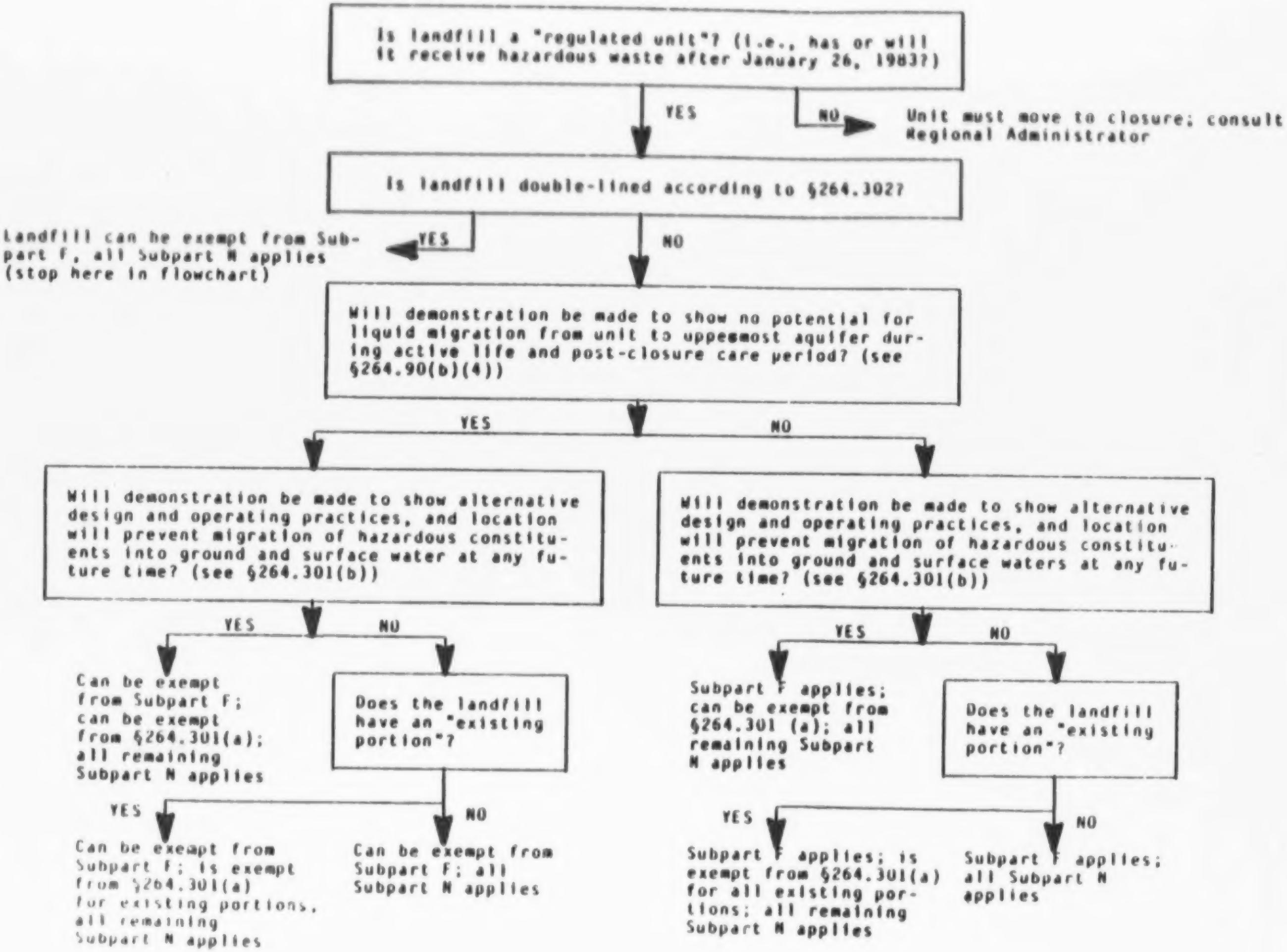
Is landfill a "regulated unit"? (i.e., has or will it receive hazardous waste after January 26, 1983?)
YES
NO
Unit must move to closure; consult Regional Administrator
Is landfill double-lined according to §264.302?
YES
Landfill can be exempt from Subpart F, all Subpart N applies (stop here in flowchart)
NO
Will demonstration be made to show no potential for liquid migration from unit to uppermost aquifer during active life and post-closure care period? (see §264.90(b)(4))
YES
NO
Will demonstration be made to show alternative design and operating practices, and location will prevent migration of hazardous constituents into ground and surface water at any future time? (see §264.301(b))
YES
NO
Can be exempt from Subpart F; can be exempt from §264.301(a); all remaining Subpart N applies
Does the landfill have an "existing portion"?
YES
Can be exempt from Subpart F; is exempt from §264.301(a) for existing portions, all remaining Subpart N applies
NO
Can be exempt from Subpart F; all Subpart N applies
Will demonstration be made to show alternative design and operating practices, and location will prevent migration of hazardous constituents into ground and surface waters at any future time? (see §264.301(b))
YES
NO
Subpart F applies; can be exempt from §264.301 (a); all remaining Subpart N applies
Does the landfill have an "existing portion"?
YES
Subpart F applies; is exempt from §264.301(a) for all existing portions; all remaining Subpart N applies
NO
Subpart F applies; all Subpart N applies

Figure 3-6. Subpart F and N requirement for landfills.

treatment, storage, and disposal facilities. The purpose of these documents is to provide details of design and operating procedures that contribute to the satisfactory performance of a facility. The current editions contain a few unit design examples. More models will be included as EPA acquires additional information.

Applicants are urged to obtain and review the TGDs applicable to their situations. The documents contain guidance, not regulations or requirements. However, the Agency feels that units designed in accordance with the specifications contained in the TGDs will meet associated Part 264 requirements. Thus designs consistent with the TGDs will likely be granted a draft Part B permit.

The RCRA Technical Guidance Document titles are:

(1) "Surface Impoundments-Liner Systems, Final Cover, and Freeboard Control"

(2) "Waste Pile Design-Liner Systems"

(3) "Land Treatment Units"

(4) "Landfill Design-Liner Systems and Final Cover"

Drafts of volumes issued in July 1982, are available in the EPA Headquarter's and Regional Offices' libraries, and the Headquarter's Subtitle C docket room. Final editions will be issued for purchase from the Government Printing Office.

3.4.1.2 Synopsis --

Surface Impoundments-Liner Systems, Final Cover, and Freeboard Control discusses design specifications for the principal components of surface impoundments (i.e., liner systems, monit g methods, overtopping controls, and closure caps). Appendices are included in the July 1982 edition that provide laboratory and field testing protocols for obtaining necessary data elements. These Appendices (Methods 9090 and 9100) will be printed separately in SW-846, Test Methods for Evaluation of Solid Waste.

Waste Pile Design - Liner Systems describes liner designs that provide an essentially impermeable base with sufficient strength to allow periodic removal of all wastes in order to physically inspect the liner. Details on suitable liner materials, liner thickness, and leachate processing are discussed. Appendices with useful test procedures are included.

Land Treatment Units identifies specific designs and various operating procedures to: maximize waste treatment; control water run-on/run-off and wind dispersal; monitor for waste constituent escape; close facility; and maintain the site after closure. Methods to demonstrate waste treatability in soil are provided along with appendices containing testing protocols.

Landfill Design - Liner Systems and Final Cover presents various liner specifications, leachate processing methods, and final cover designs that would give satisfactory performance in a given environmental setting. Appendices containing relevant testing procedures are included.

3.4.2 Technical Resource Documents (TRDs)

3.4.2.1 List --

Eight Technical Resource Documents providing design, operation, and evaluation information related to hazardous waste disposal facilities have been published to assist the regulated community and the permitting authorities. These documents describe current technologies and methods for evaluating the performance of a disposal facility design; they are not directly related to the regulations. As new information is developed, the Agency intends to update each of these documents so that they reflect the latest state-of-the-art information. TRDs are available for reading at EPA Headquarters (Library or Subtitle C Docket Room), 401 M Street, S.W., Washington, D.C., during the hours of 9 A.M. - 4:30 P.M., Monday through Friday. Copies may be purchased according to the following list from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, (202) 783-3238.

	GPO Stock No.	GPO Price
1. Evaluating Cover Systems for Solid and Hazardous Waste (SW-867).	055-000-00228-2	$4.75
2. Hydrologic Simulation on Solid Waste Disposal Sites (SW-868).	055-000-00225-8	$6.00
3. Landfill and Surface Impoundments Performance Evaluation (SW-869).	055-000-00233-9	$5.00
4. Lining of Waste Impoundment and Disposal Facilities (SW-870).	055-000-00231-2	$11.00
5. Management of Hazardous Waste Leachate (SW-871).	055-000-00224-0	$11.00

(con't)	GPO Stock No.	GPO Price
6. Guide to the Disposal of Chemically Stabilized and Solidified Waste (SW-872).	055-000-00226-6	$6.00
7. Closure of Hazardous Waste Surface Impoundments (SW-873).	055-000-00227-4	$5.50
8. Hazardous Waste Land Treatment (SW-874).	055-000-00232-1	$11.00

3.4.2.2 Synopsis --

Evaluating Cover Systems for Solid and Hazardous Waste (SW-867) presents a procedure for evaluating final cover engineering plans proposed for solid and hazardous waste land disposal facilities. Aspects of cover design are addressed in sufficient detail to allow an evaluation of the entire cover system.

Hydrologic Simulation on Solid Waste Disposal Sites (SW-868) describes the use of a computer-based model for simulating the percolation of water through cover material at a solid waste disposal site. This model is a tool for evaluating present cover materials, and the design of new landfill covers. Previous computer experience by the program user is not necessary.

Landfill and Surface Impoundment Performance Evaluation (SW-869) provides techniques for determining the adequacy of design features such as liners, drain layers, slope, and position of drains in controlling liquid waste escape from surface impoundments and landfills into the environment.

Lining of Waste Impoundment and Disposal Facilities (SW-870) discusses performance evaluation, selection, installation, and maintenance of specific liner and cover materials for certain containment situations based upon the latest technology. It includes a description of several industrial waste streams, and indicates several testing procedures for evaluating the waste/liner interaction.

Management of Hazardous Waste Leachate (SW-871) presents options for controlling, treating, and disposing of hazardous waste leachates generated by surface impoundments and landfills. Discussion includes factors that influence leachate generation, data on leachate characteristics, alternative technologies for processing leachates, and data on treatment costs and byproducts. A systematic approach is provided for selecting an appropriate leachate management method.

Guide to the Disposal of Chemically Stabilized and Solidified Waste (SW-872) describes current treatment technology, and design of long-term storage and disposal systems using stabilization/solidification of wastes. It includes data on the properties of treated wastes, and a listing of major technology suppliers with a summary of each process. Sufficient information is provided to determine relative cost/effectivness of stabilization/solidification for a particular waste and disposal system.

Closure of Hazardous Waste Surface Impoundments (SW-873) discusses the important details to consider in evaluating closure and post-closure plans for hazardous waste surface impoundments. Methodologies are presented for site specific assessments.

Hazardous Waste Land Treatment (SW-874) describes current technology and provides methods for evaluating the design and performance of hazardous waste land treatment facilities. All aspects of land treatment are discussed from initial site selection through final closure.

3.4.2.3 Future Technical Resource Documents

Evaluation of Closure and Post-Closure Care Plans for Hazardous Waste Landfills presents an overview of the current state-of-the-art technologies for closing landfill facilities.

Soil Properties, Classification, and Hydraulic Conductivity Testing is a compilation of available laboratory and field testing methods for the measurement of hydraulic conductivity of soils along with background information on relevant soil properties and classification systems. However, Method 9100 published in Test Methods for Evaluating Solid Waste (SW-846) presents the official EPA test methods for hydraulic conductivity determinations.

Solid Waste Leaching Procedure Manual provides laboratory batch procedures for extracting a leachate sample from solid waste that is similar to the composition of leachate from the waste under field conditions.

Methods for the Prediction of Leachate Plume Migration and Mixing includes a variety of programs for micro-computers and hand-held calculators. The programs can be used to predict leachate plume migration and ground-water recharge. The TRD will also include related case histories and field studies.

Hydrologic Evaluation of Landfill Performance (HELP) Model is an update of an earlier TRD, Hydrologic Simulation on Solid Waste Disposal Sites.

3.4.3 Other Guidance Manuals

3.4.3.1 Title and Availability --

Several other publications are available that cover specific topics related to land disposal. The following list contains the title, source, and price of these publications. Publications with source shown as NTIS can be ordered from the National Technical Information Service in Springfield, VA at (703) 487-4650. Publications from the Government Printing Office (GPO) may be ordered by calling (202) 783-3238. The RCRA Docket is located in the EPA Headquarters, Washington, D.C. and may be contacted by calling (202) 382-4672.

	Title	Source	Price
1.	Test Methods for Evaluating Solid Wastes (SW-846)	GPO [055-002-81001-2]	$55.00 (Subscriptio for 2 years
2.	A Method for Determining the Compatibility of Hazardous Wastes (EPA-600/2-80-076)	NTIS [PB80-221005]	$15.00
3.	Financial Assurance for Closure and Post-Closure Care: Requirements for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities-A Guidance Manual (SW-955)	NTIS [PB82-237595]	$21.00
4.	Liability Coverage: Requirements for Owners or Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities - A Guidance Manual (SW-961)	NTIS [PB82-144675]	$11.50

(con't)	Title	Source	Price
5.	Handbook for Remedial Action at Waste Disposal Sites (EPA-625/6-82-006)	NTIS [PB82-239054]	$37.00
6.	Permit Writers' Guidance Manual for Subpart F (being drafted)	N/A	N/A
7.	Permit Writer's Guidance Manual for General Facility Standards (being drafted)	N/A	N/A
8.	Ground-Water Monitoring Guidance for Owners and Operators of Interim Status Facilities (SW-963)	NTIS [PB83-209445]	$17.50
9.	RCRA Personnel Training Guidance Manual September 1980	RCRA Docket	$15.00
10.	Regional Guidance Manual for Selected Interim Status Requirements-September 22, 1980	RCRA Docket	$30.00
11.	Draft Guidance for Subpart G of the Interim Status Standards October 6, 1981	RCRA Docket	$29.00
12.	Draft Guidance for Subpart H of the Interim Status Standards August 29, 1980	RCRA Docket	$19.00
13.	Guidance Manual for the Closure of Hazardous Waste Surface Impoundments May 1980	RCRA Docket	$15.00
14.	Guidance Manual for Evaluating Permit Applications for the Operation of Hazardous Waste Incinerator Units	RCRA Docket	$15.00
15.	Guidance Document for Subpart F; Air Emission Monitoring; Land Disposal Toxic Air Emissions Evaluation Guideline.	RCRA Docket	$24.00
16.	RCRA Inspection Manual	RCRA Docket	$28.20
17.	Characterization of Hazardous Waste Sites--A Methods Manual, Volume II	N/A	N/A
18.	Land Disposal of Hazardous Waste, Proceedings of the Ninth Annual Research Symposium (EPA-600/9-83-018), Sept. 1983.	NTIS [PB84-118-777]	$35.50

(con't)	Title	Source	Price
19.	Soil Properties, Classification, and Hydraulic Conductivity Testing, Draft Technical Resource Document, SW-925, 1984.	RCRA Hotline (800)424-9346	Free, while supply lasts
20.	Solid Waste Leaching Procedure, Draft Technical Resource Document, SW-924, 1984.	RCRA Hotline (800)424-9346	Free, while supply lasts
21.	Procedures for Modeling Flow Through Clay Liners, Draft Document, EPA/530-SW-84-001, April 1, 1984.	RCRA Hotline (800)424-9346	Free, while supply lasts

3.4.3.2 Synopsis --

Test Methods for Evaluating Solid Wastes (SW-846) provides standardized laboratory procedures for determining whether a waste is hazardous as defined in Section 3001 of the Resource Conservation and Recovery Act (PL94-580), and for obtaining data to satisfy the requirement of 40 CFR Part 261, Identification and Listing of Hazardous Waste. These methods will generate data of acceptable quality to support waste evaluation and listing/delisting petitions. Included are protocols for collecting representative waste samples, determining pH, flash point, leachability, reactivity, corrosivity, ignitability, mobility of toxic constituents, and general composition of the waste. These procedures are current state-of-the-art techniques and will be periodically updated and expanded as new information is developed. The late 1983 supplement will include Methods 9100 (Methods for Determining Saturated Hydraulic Conductivity, Leachate Conductivity, and Intrinsic Permeability) and Method 9090 (Compatibility Test for Wastes and Membranes Liners). Draft versions of these methods were presented as Appendices to the July 1982 edition of the RCRA Technical Guidance Documents.

A Method for Determining the Compatibility of Hazardous Wastes (EPA-600/2-80-076) presents a procedure for determining the compatibility of combinations of two wastes or waste streams. The manual includes a chart of 41 reactivity groups. Wastes to be combined are first subjected to the analysis procedure for identification and classification into a reactive group. The chart may be used to indicate the compatibility of the classified wastes on mixing, but does not ensure compatability. Distribution of this manual by NTIS is on hold.

Copies of the previously distributed manual may be used. However, the manual does not contain assessments of compatibility for all waste types. In actual practice it is suggested that, if the manual does not address a waste type or indicates that two waste types are compatible, only small quantities of the wastes be mixed initially to assess compatibility of the specific wastes being managed. This caution is particularly applicable to wastes listed in the Hazardous Waste Compatibility Chart in Section 5 of the publication. This chart (matrix) appears to indicate that many pairs of reactivity groups are compatible. This is shown by a blank space in the matrix. If the applicant contemplates the mixing of any such pairs, test mixing of small quantities is recommended prior to co-disposal of large quantities.

The American Society for Testing and Materials (ASTM) is considering the adoption of an updated version of the document as an ASTM Standard. It is expected that ASTM will adopt a Standard for waste compatibility which will be available from the ASTM Customer Service Office, 1916 Race Street, Philadelphia, PA 19103, (215) 299-5400. Reference should be made to Committee D-34 when inquiring about the status of this ASTM Standard.

Financial Assurance for Closure and Post-Closure Care: Requirements for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities - A Guidance Manual (SW-955) describes the responsibilities of the regulated community in fulfilling the financial assurance requirements of the regulations. Tasks that must be performed by the Regional Office, and possible contingencies that may arise are discussed. A checklist of required information and sample application forms are provided. NTIS No. PB82-237595.

Liability Coverage: Requirements for Owners or Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities - A Guidance Manual (SW-961) describes the responsibilities of the regulated community in providing liability coverage for facilities, and discusses the role of the Regional Office. Included are a checklist of required information and sample application forms. NTIS No. PB83-144675

Handbook for Remedial Action at Waste Disposal Sites (EPA-625/6-82-006) describes available remedial action technologies and how they may be applied for the clean-up of hazardous waste disposal sites. A general approach to selecting an appropriate clean-up technique for a specific site is provided. NTIS No. PB82-239054.

Permit Writer's Guidance Manual for Subpart F (being drafted) provides a comprehensive examination of items covering ground-water protection requirements for permit writers to examine when reviewing Part B applications.

Permit Writer's Guidance Manual for General Facility Standards (being drafted) will discuss the information needed from all applicants from hazardous waste management facility permits (i.e., Part 264 Subparts B, C, D, E.)

Ground-Water Monitoring Guidance for Owners and Operators of Interim Status Facilties (SW-963) provides guidance for compliance with the Interim Status requirements for ground-water quality monitoring in Subpart F of 40 CFR 265. NTIS No. PB83-209445.

Characterization of Hazardous Waste Sites -- A Methods Manual, Volume II, Available Sampling Methods (being drafted) will describe 30 methods of sampling solids, liquids, and gases. The methods are applicable to sampling during routine waste site visits and hazardous spill investigations.

3.4.4 Other Reference Material

3.4.4.1 OSW Publication Inventory, July 1982 --

This inventory is a listing of solid waste information materials and reprints available from the Office of Solid Waste. Single copies may be obtained by calling the RCRA Hotline, 800-424-9346, or by writing to the U.S.EPA, Office of Solid Waste (WH-562), Program Support Branch, 401 M Street, S.W., Washington, D.C. 20460.

3.4.4.2 Future Resource Manuals --

Work is in progress on technical resource manuals in the following subject areas:

- numerical simulation techniques for design of soil liners for storage impoundments and waste piles
- further information on clay liner design
- characteristics of hazardous waste streams
- corrective actions

The availability of these manuals will be announced in the Federal Register, and in future editions of this Manual.

SECTION 4.0

GENERAL GUIDANCE FOR PREPARING A RCRA LAND TREATMENT, STORAGE, OR DISPOSAL PERMIT APPLICATION

Section 4.1 describes a recommended permit application format. Section 4.2 discusses technical assistance needs of permit applicants. In addition to this manual, other guidance documents are (or soon will be) available to assist permit applicants in addressing these topics. Rather than repeating this information, the user is referred to the appropriate publications for these details.

Sections 5.0 through 9.0 provide a thorough discussion of the specific requirements for particular types of land treatment, storage, and disposal units and the ground-water monitoring and response standards.

4.1 SUGGESTED PERMIT APPLICATION FORMAT

4.1.1 Purpose

Section 4.0 is designed to facilitate preparation of RCRA land treatment, storage, and disposal permit applications. Guidance is provided for the requirements for a Part A permit application under §270.13 and for a Part B permit application under §270.14 through §270.21, and the corresponding technical standards in Part 264. Recommended formats for the permit applications are presented below. Following these general formats should help the applicant prepare the permit application in a timely manner. When submitting an application, the applicant should be sure that the document's binding (e.g., a three-ring binder) allows for revisions during the subsequent review by EPA.

4.1.2 Part A Permit Application Format

Part A of the permit application is to be presented on EPA Forms 3510-1 (Form 1) and 3510-3 (Form 3). Copies of these forms and related instructions are shown in Appendix A. The applicant may copy these forms or obtain them from the Regional Office.

4.1.3 Part B Permit Application Format

There are no EPA forms for a Part B permit application because the detailed information required is site specific and may be presented in several different manners. The actual application format is left to the discretion of the applicant. However the EPA will use the checklists presented in Sections 5.0 through 8.0 to determine the completeness of the application. A simplified version of these lists is shown below. EPA's Analysis of the application and ability to efficiently communicate with the applicant will be aided if the applicant provides the information in the order shown.

A. General Information Requirements

- Part A permit application if not previously submitted or if information has changed since submitted.
- General description of the facility.

- The process code(s) (from the Part A permit application) that identify the type(s) of unit(s) for which permits are requested.
- Chemical and physical analysis of hazardous wastes to be handled.
- Waste analysis plan.
- Security description for the active portion of the facility.
- General inspection schedule and description of procedures (including specific requirements for particular unit types).
- Preparedness and prevention documentation or justification of waiver request.
- Contingency plan documentation (including specific requirements for particular unit types).
- Preventive procedures, structures, and equipment documentation for control of unloading hazards, waste run-off, water supply contamination, effects of equipment failure and power outages, and undue personnel exposure to wastes.
- Prevention of accidental ignition or reaction documentation (including specific requirements for particular unit types).
- Traffic documentation.
- Facility location documentation.
- Personnel training program documentation.
- Closure plan documentation (including specific requirements for particular unit types).
- Post-closure care plan (when applicable) (including specific requirements for particular unit types).
- Documentation of deed notice (applicable to existing facilities only).
- Closure cost estimate and documentation of financial assurance mechanism.

- Post-closure cost estimate and documentation of financial assurance mechanism.

- Documentation of insurance.

- Documentation of coverage by a state financial mechanism (if applicable).

- Topographic map showing contours with 0.5-2.0 m (2-6 ft) intervals, map scale and date, 100-year flood plain area, surface waters including intermittent streams, surrounding land uses, wind rose, north orientation, legal boundaries of facility, access control, injection and withdrawal wells, buildings and other structures, utility areas, barriers for drainage or flood control, and location of operating units including equipment cleaning area. Each hazardous waste management unit should be shown on the map with a unique identifier (number, etc.) and the associated process code from the Part A application.

B. Specific Information Requirements

See sections 5.0 through 9.0 for specific information requirements for each type of facility. Also refer to Subparts K, L, M, and N of Part 264.

C. Additional Information Requirements

- Summary of ground-water monitoring data obtained during the interim status period.

- Identification of aquifers beneath the facility.

- Delineation of waste management area and "point of compliance" for ground-water monitoring on topographic map.

- Description of any existing plume of contamination in ground water.

- Detailed ground-water monitoring program description. (This section can be combined with # 6, 7, or 8, as appropriate.)

- Detection monitoring program description, if applicable.

- Compliance monitoring program description, if applicable.

- Corrective action program description, if applicable.
- Justification for any proposed waiver to the Part 264 Subpart F Ground-Water Protection Standards

4.1.4 Format Suggestions

It is suggested that the permit application be prepared and presented in two distinct portions - a basic or general application and a series of specific attachments. The basic application should include the requirements of the General Facility Standards such as general identification information, purpose of the application and general remarks. It should address (but not necessarily contain) all specific, technical information necessary to obtain a permit.

For example, for a proposed liner system the basic application might include a statement that a single, synthetic liner will be used at the proposed unit and that the liner system design including, specifications, plans, installation procedures, etc. are attached as Attachment __. Thus the basic application could be reviewed during the Administrative Completeness Check to assess the completeness of the application. Later, both parts of the application would be reviewed for technical aspects.

Specific technical portions of the permit application should be presented in the form of self-contained attachments. Each attachment should contain the information, data, maps, calculations, logs, etc. to fulfill the permit application requirements for a specific feature of the proposed facility; e.g. liner system design or detection monitoring plan. The basic application should refer to the attachments such that the permit writer can easily relate the general discussions to the attachments.

The concept of attachments to a permit application is included in Sections 5.0 through 9.0. An attachment is suggested for each major technical aspect of a permit application (e.g. run-off control system, cover design, management plan for incompatible wastes, etc.). Suggested attachments are in the sections of the text entitled "Guidance to Address the Application Information Requirement". A list of all suggested attachments is included in Appendix C.

The attachments will greatly facilitate the review of permit applications and the subsequent writing of the permit. Reviewers and permit writers will, in turn, assess these attachments and incorporate them into the permit. Thus the permit may contain the attachments prepared by the applicant, either as originally written or as modified by EPA. The attachments essentially describe how a requirement will be fulfilled. The applicant proposes and justifies why his approach fulfills the requirements in either the attachment or in the general application as appropriate. The EPA assesses the material and permits construction and operation as described in the permit. The use of attachments facilitates the review and the revision of permit applications and permits themselves. If several attachments are acceptable as proposed by the applicant, they may be incorporated into the permit unchanged. If some require additional information

EPA or returned to the applicant instead of returning the entire permit application.

Attachments should be clearly identified. An identification such as Attachment A and a title should be used consistently, in both the basic permit application and on the attachments. Attachments should have page numbers, figure numbers, etc., that relate to the attachment identifier (e.g., Figure A-1 or Table C-3). Enough applicant and facility information should be provided on the first page of each attachment to uniquely identify the application of which it is a part.

Again, the loose-leaf binding(s) format is encouraged for both attachments and any confidential business information.

Checklist matricies are included for each unit type at the end of Sections 5.0 through 8.0 respectively. They identify the permit application and associated facility standard requirements as related to the unit types. Applicants are encouraged to use these checklists to insure that a complete application is submitted. Space is provided for the applicant to indicate the location of each required item in the application (e.g. page 13, Appendix C, etc.). This information should be typed or printed in the space provided.

It is suggested that applicants include in the application a copy of the checklist(s) for each type of unit proposed. The checklists(s) should be an early part of the basic portion of the application. It will be used by EPA to assess completeness and will facilitate technical review.

4.1.5 Term of Permit

Applicants should be aware that RCRA permits are issued for a fixed term that cannot exceed 10 years (see §270.50). If the permittee wishes to continue the operation of the facility beyond the expiration of the permit, he must apply for a second (third, etc.) permit before the expiration of the current permit (see §270.51). This means that applicants may wish to design facilities in discrete, 10 year (maximum) parcels. This concept is described in Figure 4-1.

4.2 TECHNICAL ASSISTANCE

Most applicants will require technical assistance in the preparation of a permit application. Assistance will likely be needed from specialists including: engineers, geologists, hydrogeologists, and soil scientists (particularly for land treatment units). These specialists may be part of the applicant's staff or outside consultants. The Agency feels that applicants will get the best service (designs, plans, etc.) and thus the most complete application if they use only fully qualified technical expertise. Especially important is experience in hazardous waste management closely related to the proposed facility.

4.2.1 Engineers

Section 264.115 requires certification by a registered, professional engineer that a facility has been closed in accordance with an approved closure plan. Part 264 and other regulations and documents related to land-based hazardous waste management refer to the involvement of engineers or qualified

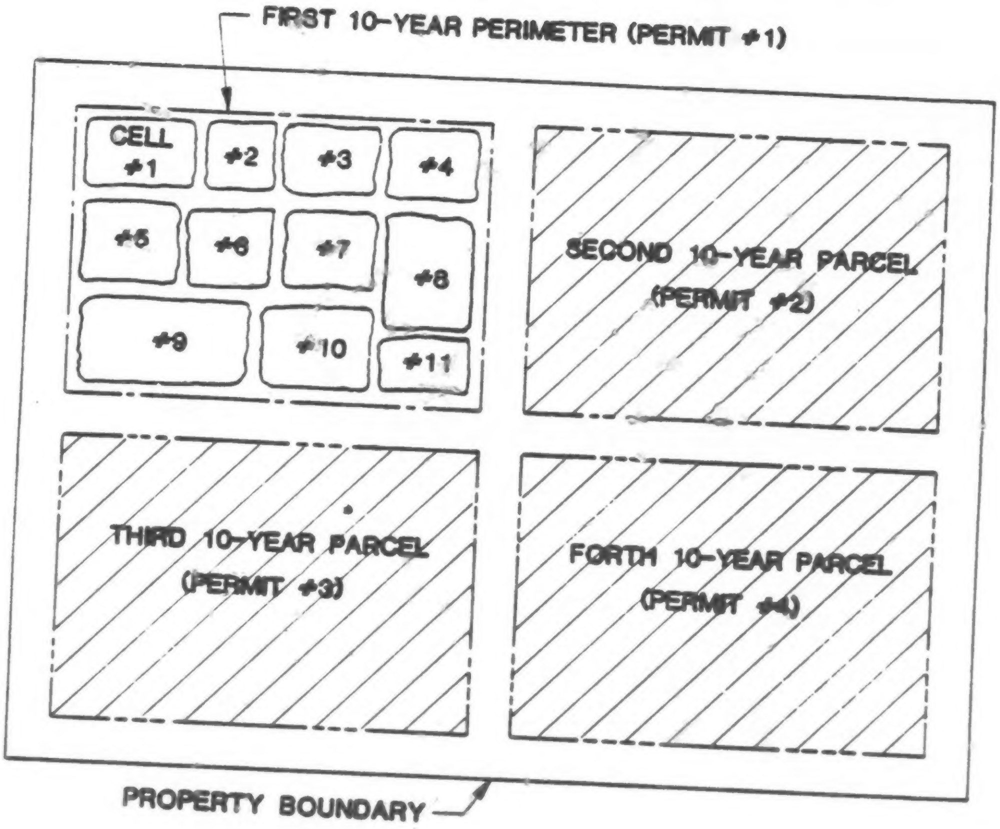
FIRST 10-YEAR PERIMETER (PERMIT #1)
CELL #1
#2
#3
#4
#5
#6
#7
#8
#9
#10
#11
SECOND 10-YEAR PARCEL (PERMIT #2)
THIRD 10-YEAR PARCEL (PERMIT #3)
FORTH 10-YEAR PARCEL (PERMIT #4)
PROPERTY BOUNDARY

Figure 4-1. Concept of 10-year permits

engineers in facility design and the preparation of permit applications.

Engineers are registered by all 50 states. Registration is based on combinations of education, experience, and examinations. It licenses engineers to practice their profession and includes legal and ethical restrictions regarding the technical extent to which services may be offered. Registered engineers may not practice beyond their areas of expertise. Additionally, registered engineers are required by law to place public health, safety, and welfare preeminent to other aspects of their assignments.

The prudent applicant should get the best help possible in the preparation of a permit application. EPA recommends that engineers experienced in hazardous waste management be involved with preparation of permit applications. Additionally, it strongly recommends that registered, professional engineers (registered in the State in which the facility is located) be utilized in the development of necessary designs, specifications, certifications, etc. The combination of applicable experience and registration on the part of engineers involved should result in an application (and resultant facility) that meets the technical requirements of the regulations. This manual refers to qualified or to registered engineers in several sections Proper qualifications are most important; however, professional registration is also considered an important credential. If the regulations require a registered engineer, even the bes qualified, non-registered engineer will not meet the requirements

4.2.2 Geologists, Hydrogeologists, and Soil Scientists

Experience related to land-based hazardous waste management is again the most important credential for these technical specialists. Some states register geologists (and thus hydrogeologists) in a manner similar to engineers. If your state registers geologists, it is recommended that experienced, registered geologists be involved with the permit application.

In lieu of registration, several national organizations certify geologists, hydrogeologists, and soil scientists. Certification generally indicates that an individual has the basic educational requirement and (usually) experience to be considered a member of that profession.

SECTION 5.0

SURFACE IMPOUNDMENT PERMIT APPLICATION GUIDANCE

Two important distinctions are introduced here to alert the user of this manual to the alternatives available for permitting surface impoundments. The regulations distinguish between storage and disposal surface impoundments based on the manner in which the impoundment is closed. Permittees are offered two alternatives for closing their impoundments. The first is to remove or decontaminate all wastes, waste residues and contaminated soils and liners at closure. If this alternative is selected the impoundment is considered a storage impoundment. The second is to leave wastes, residues, or contaminated soils and liners in place, eliminate free liquids, stabilize the wastes, place a cap (final cover) on top of the waste, and conduct post-closure monitoring and maintenance. An impoundment closed in this manner is considered a disposal impoundment.

The regulations further provide that, in the case of a storage impoundment, the liner may be constructed of materials that may allow wastes to migrate into the liner (but not into the adjacent subsurface soil or ground water or surface water) during the active life of the unit, provided that the liner is removed at closure. Thus, in appropriate situations, clay or admixed impervious materials may be acceptable liner materials. However, in the case of a disposal impoundment, the liner must be constructed of materials that prevent wastes from passing into the liner. Synthetic liners, although not specifically required, are viewed by EPA as the only commonly used materials that would meet this standard. These important distinctions are introduced here to alert the user of this manual to the alternatives available for permitting surface impoundment. Further technical guidance is provided in in the appropriate parts of this section.

The regulations promuigated in Part 264 apply to both existing and new surface impoundments. Part 264, Subpart K contains the design and operating standards. This section of the manual is subdivided into ten subsections:

5.1 Waste Description
5.2 Design and Operating Requirements
5.3 Monitoring and Inspection
5.4 Dike Certification by a Oualified Engineer
5.5 Removal of Impoundment from Service
5.6 Closure and Post-Closure Care
5.7 Special Requirements for Ignitable or Reactive Wastes
5.8 Special Requirements for Incompatible Wastes
5.9 References
5.10 Checklist

A list of suggested attachments to permit applications for surface impoundments is shown in Appendix C.

5.1 WASTE DESCRIPTION

5.1.1 The Federal Requirement

Section 270.17(a) requires that the Part B application include:

> A list of the hazardous wastes placed or to be placed in each surface impoundment;

The above Part 270 requirement does not apply to any one specific Part 264 standard for impoundments. The required information is necessary to comply with all the surface impoundment requirements.

5.1.2 Guidance to Achieve the Part 264 Standard

The general facility standards [specifically, Section 264.13(a)] require the applicant to complete waste analyses as necessary to treat, store, or dispose of wastes in accordance with all of the Part 264 standards. The Permit Applicant's Guidance Manual for General Facility Standards (1), provides guidance on waste analysis and waste analysis plans.

5.1.3 Guidance to Address the Application Information Requirement

The applicant should submit a list of all hazardous wastes that will be disposed of in the surface impoundment. A suggested attachment to the permit application is List of Hazardous Wastes. The following information on each waste should be reported:

- Common name of the waste
- EPA hazardous waste ID number
- Location(s) where the waste is or will be placed (e.g., surface impoundment number)
- Volume of waste received per month, including actual or estimated averages, maximums and minimums
- Form of the waste when disposed (e.g., liquid, sludge, etc.)
- Approximate moisture or solids content and other significant features
- Special handling requirements.

The applicant should submit data on the form or physical classification of the waste. The following is a brief description of the physical classes of waste. Aqueous-inorganic (AI) and aqueous-organic (AO) are classes of waste in which water is the solvent (predominant liquid), and the solutes are mostly inorganic and organic, respectively. Organic (O) is the class of waste in which the predominant liquids are organic, and the solutes are mostly other organic chemicals dissolved in the organic solvent. Solids, sludges, and slurries (S) are wastes high in solids such as tailings, settled matter, or filter cakes.

The sampling and analytical methods applicable to identifying the characteristics of hazardous waste placed in surface impoundments are described in Part 261 of the regulations and in EPA Publication Number SW-846, "Test Method for the Evaluation of Solid Waste, Physical/Chemical Properties" (2).

The applicant is advised that additional waste analysis information must be included in Part A of the application and in the general facility description. Part A must include a specification of the hazardous wastes to be treated, stored or disposed of at the facility, an estimate of the quantity of such wastes to be treated, stored or disposed of annually, and a general description of the processes to be used for such wastes. Reference 1 includes guidance on the general information requirements (i.e., §270.14) on waste analyses.

5.2 DESIGN AND OPERATING REQUIREMENTS

This section provides guidance on the permit application information requirements related to the design and operating requirements in §264.221. This section addresses the Part 270 and Part 264 standards in the order in which they appear. Topics addressed include the following:

- 5.2.1 Liner System Design
- 5.2.2 Liner Exemption Variance
- 5.2.3 Prevention of Overtopping
- 5.2.4 Structural Integrity of Dikes
- 5.2.5 Ground-Water Protection Exemption

5.2.1 Liner System Design

5.2.1.1 The Federal Requirements --

Section 270.17(b) requires that the Part B application include:

> Detailed plans and an engineering report describing how the surface impoundment is or will be designed, constructed, operated, and maintained to meet the requirements of §264.221. This submission must address the following items as specified in §264.221:

(A) The liner system (except for an existing portion of a surface impoundments)....

Section 264.221(a)(1)-(3) states:

> A surface impoundment (except for an existing portion of a surface impoundment) must have a liner that is designed, constructed, and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water at any time during the active life (including the closure period) of the impoundment. The liner may be constructed of materials that may allow wastes to migrate into the liner (but not into the adjacent subsurface soil or ground water or surface water) during the active life of the facility, provided that the impoundment is closed in accordance with §264.228(a)(1). For impoundments that will be closed in accordance with §264.228(a)(2), the liner must be constructed of materials that can prevent wastes from migrating into the liner during the active life of the facility.

The liner must be:

(1) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;

(2) Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift.

(3) Installed to cover all surrounding earth likely to be in contact with the waste or leachate.

5.2.1.2 Guidance to Achieve the Part 264 Standard --

Section 264.221(a) contains these key points:

- It does not require the installation (retrofitting) of a liner for existing portions of existing surface impoundments;
- It distinguishes between the performance required of liners at disposal impoundments versus storage impoundments; and -
- It establishes general performance standards for liners, (i.e., a disposal impoundment must have a liner that prevents wastes from passing into the liner during the life of the facility, while a storage impoundment can use a liner that allows seepage into the liner but not out of the liner during the life of the facility).

An "existing portion" means that land surface area of an existing waste management unit, included in the original Part A permit application, on which wastes have been placed prior to issuance of a Part B permit. Existing portions are exempt from the requirements to install liners. However, they remain subject to the remainder of the design and operating requirements in §264.221, as well as the ground-water protection requirements.

The regulations allow two distinct types of surface impoundments. These are: impoundments used for storage and treatment, and impoundments used for disposal. In both cases the liner system is required to function through scheduled closure and to consist of at least one liner. The key distinction between the design of storage versus disposal impoundments lies in the type of liner(s) used. EPA recommends that:

- Liner systems for storage or treatment impoundments where the waste will be removed at closure should consist of a single soil (clay) or synthetic liner, as a minimum; and
- Liner systems for disposal impoundments where the waste will remain at closure should consist of a single synthetic liner, as a minimum.

For storage and treatment impoundments, the waste must be removed at closure; liquids can enter the liner but can not migrate through it. For disposal impoundments, the waste will be left in place at closure; liquids must be prevented from passing into the liner.

EPA interprets the general performance standard for disposal impoundments to mean that only synthetic liners comply with §264.221(a). Synthetics are essentially 100 percent effective, when undamaged, in rejecting leachate reaching the liner surface. The Agency realizes that very small amounts of liquid may enter the structure of synthetic membranes causing them to swell, but the amount is considered negligible. The Agency believes that clay liners are valuable as a backup to synthetic liners and recommends their use as an extra measure of protection in all cases. Where final cover will not be applied for more than 30 years, however, the Agency does not discourage a secondary clay liner as a backup, should the synthetic primary liner deteriorate.

There are several different types of synthetic liners; each compatible with certain types of wastes, but incompatible with other types. No one liner material can be used with all wastes. The following generic types of liners are available:

- High-density polyethylne
- Hypalon (chlorosulfonated polyethylene)
- Polyvinyl chloride
- Chlorinated polyethylene

Some soil materials, typically those classified as clays, can be placed and compacted to produce a liner system of very low permeability for use in storage impoundments. Movement of liquids through well constructed clay liners is very slow, as long as the soil fabric of the liner is not adversely affected by the waste materials or is not otherwise damaged. As a result the release of liquid-containing hazardous constituents to the ground water and surrounding soils is effectively minimized.

In addition to the general liner performance standards, §264.221(a)(1)-(3) includes several subsidiary performance standards intended to assure that liners will meet their performance goals. These subsidiary standards consist of general, common-sense engineering goals addressing:

- Chemical characteristics of liners;
- Liner strength and thickness
- Liner foundations
- Liner lateral extent

Detailed guidance on how to comply with these standards is provided in RCRA Guidance Document Surface Impoundment Liner Systems and Final Cover, and Freeboard Control, Reference 3 and Lining of Waste Impoundments and Disposal Facilities, EPA publication SW-870, Reference 4.

5.2.1.3 Guidance to Address the Application Information Requirement --

Liner selection and design is one of the most difficult aspects of surface impoundment design. The liner serves as a primary barrier to leachate migration. It must be chemically compatible with this leachate, and strong enough to resist tearing during installation and operation. The nature of the liner foundation is an integral part of liner design. To address the application information requirements for liner design, the applicant is advised to submit information on the following three areas:

- Liner Specifications
- Foundation Analysis
- Liner Integrity Analysis

A suggested attachment to the permit application is Liner System Design. The attachment should contain detailed specifications, raw data, calculations, drawings, assumptions, and so forth, supporting the proposed design. A discussion of the rationale supporting the overall design should be included in the basic portion of the application. The discussion should present the reasons why and how the design meets the specific requirements.

5.2.1.3.1 Liner Specifications -- The applicant should identify the materials of construction, specifications of strength and thickness, and chemical properties of the proposed liner. The applicant should also submit design plans that show the method of liner placement in the surface impoundment unit(s); this should demonstrate that the liner will cover all areas of the unit that will be exposed to wastes and leachate.

The applicant is responsible for all aspects of the application including material and installation specifications. Material specifications can be taken from the specifications provided by the manufacturer, as long as the applicant proposes these as the minimum acceptable specifications. The Liner Integrity Analysis section describes the nature of engineering reports to justify the selected liner strength, thickness, and chemical compatibility. Appendix VIII of Reference 4 can be used to obtain minimum values of properties of a synthetic liner that are necessary to specify a quality liner material. The liner design plans should be in standard construction drawing format. The plans should show the extent of areal coverage for each unit. The plan should also present cross-sectional views. Details of seaming methods, anchoring, techniques to avoid physical stress concentrations, and other special features should be provided in the plans and in narrative form. Guide specifications for the construction of synthetic liners are included in Appendix D. These specifications are not endorsed by the Agency, but do contain elements considered important to the construction of a quality liner.

5.2.1.3.2 Foundation Analysis -- The soils beneath a liner support the liner, waste, and cover. If these soils settle, shear, or uplift, the liner may be damaged. Hydrostatic and gas pressure can also impact on liner performance. The potential for these situations to occur at a given location can be reliably assessed by a qualified, registered geotechnical engineer. In many cases, standard engineering practices can be implemented to alleviate potential liner deflection due to unnecessary stress concentrations.

The foundation analysis should be reported in the Liner System Design attachment. The analysis should assess the potential for liner deflection due to settlement, compressive, shear forces, or uplift of the foundation soils, and due to hydraulic and gas pressures on the underside of the liner. The following items should be considered in this report:

- Geologic Data. A description should be provided of regional and site geology, including:
    - -- geologic setting
    - -- soil types and characteristics (including boring logs)
    - -- bedrock types and depths (including boring logs)
    - -- subsidence history
    - -- sinkhole potential

[Note that much of this information is also recommended in Section 9.0.]

- Geotechnical Data. A subsurface investigation should be conducted and a description provided of the engineering characteristics of the foundation soils. Data on soil index properties, shear strength, hydraulic conductivity, and compressibility should be provided.

- Hydrogeologic Data. A description should be provided of the characteristics of the saturated zone of the site, including its relationship to surface water. Section 9.0 can be used for further guidance on this topic.

- Seismic Setting. A description should be provided on the potential for ground shaking and surface rupture at the site. While the facility may not be in a jurisdiction in which the seismic location standard [§264.18 (a)] is applicable, it is advisable to design a facility to withstand a design earthquake. Information on the frequency and magnitude of earthquake activity may have been established and local standards adopted for design of structures. Generally, earth structures can be easily designed to withstand the vertical and horizontal accelerations experienced during such design earthquakes.

The report should summarize the foundation investigation and analysis. It should include all data collected during the investigation, all calculations performed in the analysis, and a description of the methods used in the investigation and analysis. Total and differential settlements that can occur during the active and closure period of the unit should be estimated, including immediate settlement, primary and secondary consolidation, creep, and liquefaction. Also, the bearing capacity and stability of the foundation should be evaluated.

The subsurface investigation should thoroughly characterize the in situ properties of the subsurface materials. The subsurface exploration should consist of test borings and test pits, and may also include geophysical surveys.

Test borings should be performed to adequate depths and at a sufficient number of locations to define the subsurface conditions. The method of drilling should be based on a preliminary subsurface investigation. Test pits should be excavated to identify near-surface conditions. Geophysical surveys may be performed to more accurately identify bedrock depths and fractured zones. Other types of geotechnical tests (i.e., cone penetrometer, standard penetration) may be performed as required for the specific conditions at the site. Many standard techniques for geotechnical investigations are available in the following publications:

> American Society for Testing and Materials (ASTM). Sampling of Soil and Rock. Special Technical Publication 483, June 1970.
>
> Hvorslev, M. Juul. Subsurface Exploration and Sampling of Soils for Civil Engineering Purposes. Army Corps of Engineers, Waterways Experiment Station, 1965.

The subsurface investigation program can be combined with the investigations undertaken in response to the ground-water monitoring and aquifer identification requirements in Part 264, Subpart F.

Laboratory testing of subsurface materials should be conducted to determine index properties and engineering parameters. Index property testing should include:

- Grain size distribution curves
- Atterberg limits
- Consolidation tests for cohesive materials

- Shear strength
- Moisture content and dry density

Shear strength of soils may be determined using direct shear or triaxial testing with triaxial tests preferred. The methods for saturated hydraulic conductivity determination described in Reference 5 (Method 9100) should be used; in most cases, hydraulic conductivity (often referred to as permeability) should be determined using field methods, rather than laboratory techniques. The compressibility characteristics should be determined by performing a sufficient number of consolidation tests.

5.2.1.3.3 Liner Integrity Analysis -- The integrity of a liner is a function of several factors. Incompatible chemicals can dissolve the liner. Excessive stress during either installation or operation can cause tears or failed seams. Climate can also adversely affect liners exposed to the elements. It is critical that a liner be carefully selected to be compatible with the wastes that it must contain. The liner must also have adequate strength to resist tearing during installation. It may be protected from puncturing during installation and operation by underlying and overlying bedding layers. Seaming techniques are extremely important as well. Finally, the liner should have sufficient strength to resist failure from any anticipated or likely settlement or movement of the foundation.

The applicant should submit a detailed report presenting site-specific test data demonstrating integrity against:

- Liner contact with waste (i.e., waste-liner compatibility)
- Internal and external pressure gradients
- Climatic conditions
- Installation stresses
- Daily operational stresses

Waste/Liner Compatibility

The applicant should submit results of compatibility testing. These results should demonstrate the acceptability of the selected synthetic liner. The following information should be provided on the tests used to make the compatibility demonstrations:

- The name of test method that was used.
- The procedure and details of the test method (e.g., number of test specimens, length of the test, and the nature of leachate used).
- Chemical and physical characteristics of the waste(s) tested, including the EPA hazardous waste number, physical class (e.g., aqueous-inorganic, aqueous-organic; organic, solid, sludge, etc.), and waste sources (including description of production and waste treatment processes from which the waste stream is generated).
- The raw test results.
- An explanation of how the raw test results were interpreted to lead to the selection of the synthetic liner proposed as the primary liner for the surface impoundment.

An acceptable test method for examining the compatibility of wastes/leachate and synthetic liners is the "Immersion Test of Membrane Liner Materials for Compatibility with Wastes," and is referred to as Method 9090 in Test Methods for Evaluating Solid Waste (Reference 2). An earlier form of this test was published as Appendix A in the July 1982 RCRA Technical Guidance Document entitled Landfill Design: Liner Systems and Final Cover (Reference 5).

Liner manufacturers commonly provide information on the compatibility of their liners with single chemical compounds. This information is, generally, in the form of qualitative rankings (e.g., resistant, poor), rather than in quantitative form. These types of data may be supportive, but will not be accepted as definitive proof of compatibility. In most actual situations, a liner will be exposed to a combination of waste types, rather than to a single chemical compound. Consequently, the manufacturers' tests do not adequately simulate field exposure conditions. Also, EPA is not aware of the numerical bases used by manufacturers in establishing their qualitative rankings. EPA must examine the raw data from each exposure test.

Waste compatibility tests should be conducted using representative samples of the wastes and leachates to which the liner is, or will be, exposed. Several methods for obtaining samples of hazardous wastes are discussed in Section 1 of Test Methods for Evaluating Solid Waste (2). Reference 8 also provides information on collecting leachate samples (at existing facilities). For new facilities, applicants should use leachate from an existing facility similar to the one proposed and/or the procedures described in Reference 11, Solid Waste Leaching Procedure. Selection of a method depends on the ambient physical state of the waste to be sampled (liquid, slurry, solid). If the waste is a liquid or has a free liquid component, this liquid is called the primary leachate and must be included in the sample. If the waste is a solid or slurry that does not have a free liquid component, then the procedures given below for extracting primary and secondary leachates should be employed.

The primary leachate is the liquid that can be extracted from the waste by vacuum filtration at 25° C and 15.3 kg/cm^2 (15 bars) of vacuum. It should be measured as a percentage of the total waste on a wet weight basis. If there is one distinct immiscible phase in the primary leachate, collect enough of each phase (approximately 5 liters) to perform the compatibility testing with each phase. The secondary leachate is a fluid extracted by vacuum filtration after mixing the waste thoroughly with just enough water to make a saturated paste (waste barely flows together into a hole in the paste made with a spatula).

The Agency encourages applicants to include the use of liner samples (coupons) in the liner system design. The coupons should be separate pieces of liner material at least one foot square, and include one field seam. The coupons are placed in the waste management unit and later retrieved and tested to assess liner integrity. Testing of the coupons can forewarn permittees of liner deterioration far enough in advance so that remedial action may be taken before failure results in catastropic contamination and immense costs for corrective action. The Agency also hopes to obtain data from sites using coupons to further the knowledge of liner integrity. See Section 5.4.7 of Reference 4 for more details on the use of coupons.

Climatic Conditions

During the liner system design, the applicant should consider the impacts of the local climate on the material(s) selected. Data supporting the liner selection with regard to climate should be submitted in the application, including:

- Extremes of air temperatures at the units' location.
- Depth of soil freezing including local building codes regarding subsurface foundation construction.
- Average monthly temperatures and relative humidity readings.
- Maximum depth to permafrost (applicable only to sites in Alaska).
- Data regarding the proposed liners' reactions (cracking, loss of strength, etc.) to the above conditions.
- Wind data shown as a wind rose.

The above climatic data should be available from the nearest office of the National Weather Service. These offices are often located at airports. Building codes can be obtained from local county offices issuing building permits.

Liner manufacturers' data concerning the responses of the proposed liner to the local climatic conditions should be included. Quantitative data should be provided where available. These should include liner strength; and resistance to tearing, puncture, and other failures at the range of conditions likely to be encountered. Cracking tendency is of critical importance for liners that are to be installed in cold climates and exposed to a seasonal freeze-thaw cycle. Manufacturers and other data should be submitted indicating the materials' resistance to cracking.

Applicants may be able to reduce negative effects of local climate through proper design techniques and/or selection of materials. A liner installed entirely below the local freeze line will not be subjected to the freeze-thaw cycle and resulting stresses. Materials for the upper (above freeze line) portion of a liner may be selected of one material and the lower portion of another. However, caution should be exercised concerning waste-liner compatibility and the ability to join dissimilar materials.

Installation Stresses

Stresses during installation can come from both below and above the liner. The subgrade or bedding material on which the liner is placed can exert pressure if rocks, roots, or similar materials remain near the surface. Placement of the liner itself and seaming techniques can stress the liner. Similarly, wind conditions can stress the liner during installation. Action of earthmoving equipment spreading any bedding layer above the liner can also stress or damage a liner. The liner system design should take into account these considerations and include the following information:

- Whether a bedding material will be placed above or below the synthetic liner. The thickness of this bedding layer, the type of material used in the bedding layer and a drawing of this layer in relation to the placement of the synthetic layer should be provided. Methods to prepare the bedding material surface (discing, compaction, rolling, etc.) should be described. An explanation of how the synthetic liner will be protected from punctures or tears during installation and operation should be provided if a protective bedding layer is not proposed in the design.

- Treatment of bedding material to prevent plant growth (sterilization) should be described.

- Slope of the sides of the unit and the ability of the sides to resist creep or slumping during installation.

- Methods to be used to place bedding material over liners, as well as specifications for the bedding material.

The Liner System Design should thoroughly address the above items. The application should include engineering drawings, detailed construction specifications, and technical reports, as necessary. More details are available in Chapter 5 of Reference 4.

Operational Stresses

Daily operation of a surface impoundment may apply stresses to the liner(s). The Liner System Design should account for these stresses and minimize them. Information in the application should include the following:

- Soils data indicating that adequate protection will be provided to minimize operational stress.

- Design considerations that will minimize liner stress. This is particularly important for high-traffic areas around fill points, monitoring stations, and discharge points. Liner stress due to wind and wave action should also be considered.

- Traffic patterns at the site, particularly near the edges of the liner(s).

Depending on the soils, climate, and operations, the bedding layer, surface roadways and other features may have to be periodically thickened, regraded, compacted, or otherwise maintained to reduce liner stress. Applicants should consider these possibilities and include them, as appropriate.

Pressure Gradients

Pressure gradients caused by soil movement, liquids above and below the liner(s), and gases above or below the liner(s), may be sources of liner stress. These situations should be considered and a liner with adequate strength and thickness should be selected. Information in the application should include:

- Potential for the foundation to be partially lost or deformed due to piping, sinkholes, decomposition of organic matter, slumping, differential settlement associated with concrete structures, and the ability of the liner to withstand resulting stresses.
- Impact of unexpected changes in water level above or below the liner(s).
- Potential for gas to be generated below or around the liner.

In addressing information regarding internal and external pressure gradients, the applicant should submit detailed engineering reports demonstrating that the liner system will withstand the various predicted physical stresses throughout the active life of the surface impoundment. Geotechnical information may be obtained from the foundation analysis. The soils factors listed above should be considered during site selection and design, and applied to liner selection. The impact of unusual water conditions should be analyzed. Often, soil-related problems are caused by unusual water situations (often associated with leaks through the liner). It may be wise to assess both together in a near worst-case scenario in the development of the Liner System Design. This worst-case scenario should assume that there will be a leak in the liner.

The applicant should consider potential gas pressure when designing the liner(s). Gas may be present or generated beneath impoundment liner(s). Sites founded on soils containing significant amounts of organic matter have potential gas problems. Existing units may be releasing gas to the subsurface. New units built near existing units might be affected by this gas. This is especially true of new hazardous waste impoundments adjacent to sanitary landfills, either active or closed.

Surface impoundments may be susceptible to a condition known as "whale backs." This occurs when a liner becomes buoyant from accumulating gas or ground-water uplife and partially floats to the surface of the impoundment. The Liner System Design should assess the potential for such a situation and include design features to prevent it. These may include a series of gas vents below the liner and venting along the impoundment sides.

5.2.2 Liner Exemption Variance (Not Applicable to Existing Portions)

5.2.2.1 The Federal Requirement --

Section 270.17(b)(1) contains the following:

> If an exemption from the requirement for a liner is sought as provided by §264.221(b), submit detailed plans and engineering and hydrogeologic reports as appropriate, describing alternate design and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituents into the ground water or surface water at any future time;

Section 264.221(b) states:

> (b) The owner or operator will be exempted from the requirements of paragraph (a) of this section if the Regional Administrator finds, based on a demonstration by the owner or operator, that alternate design and operating practices, together with location characteristics, will prevent the migration of any hazardous constituents (see §264.93) into the ground water or surface water at any future time. In deciding whether to grant an exemption, the Regional Administrator will consider:
>
> (1) The nature and quantity of the wastes;
>
> (2) The proposed alternate design and operation;
>
> (3) The hydrogeologic setting of the facility, including the attenuative capacity and thickness of the liners and soils present between the impoundment and ground water or surface water, and
>
> (4) All other factors which would influence the quality and mobility of the leachate produced and the potential for it to migrate to ground water or surface water.

5.2.2.2 Guidance to Achieve the Part 264 Standard --

The applicant may request a variance from the requirement to install a liner system on new units or new portions of existing units by providing a thorough and convincing demonstration that the performance goals described in this section will be achieved without an installed liner system.

5.2.2.3 Guidance to Address the Application Information Requirement --

If an exemption from the liner requirement is being requested for a new unit, the application should include:

- Locational determinations relevant to assessing the potential for leachate migration, such as soil permeability and attenuative capacities, site geology and geohydrology.
- A demonstration that facility design, locational aspects, operating practices, closure and post-closure care plans will prevent the contamination of surface water and groundwater at any future time.

A suggested attachment to the permit application is Report Supporting Request for Exemption from Liner Requirement.

5.2.3 Prevention of Overtopping

5.2.3.1 The Federal Requirement --

Section 270.17(b) requires that the Part B application include:

> Detailed plans and an engineering report describing how the surface impoundment is or will be designed, constructed, operated, and maintained to meet the requirements of §264.221. This submission must address the following items as specified in §264.221:
>
> ...(B) Prevention of overtopping:

Section 264.221(c) states:

> A surface impoundment must be designed, constructed, maintained, and operated to prevent overtopping resulting from normal or abnormal operations, overfilling, wind and wave action; rainfall; run-on; malfunctions of level controllers, alarms, and other equipment; and human error.

5.2.3.2 Guidance to Achieve the Part 264 Standard --

The regulating language reflects the variety of potential causes of overtopping. Constructing dikes to provide a specified amount of freeboard above expected levels in the impoundment is one means of controlling overtopping. Operating practices such as adjusting inflows and outflows to regulate the impoundment level, or using automatic level controllers or alarms, will also help prevent overtopping when potential problems, such as unusually large storms, occur.

The term "prevent" is absolute, reflecting the Agency's view that outflow of liquid hazardous wastes over the top of an impoundment, poses a serious threat to human health and the environment. For additonal guidance, the applicant should refer to Reference 3. Reference 3 includes discussions of "fool proof" methods of preventing overtopping instead of reliance on an assumed balance between evaporation and precipitation plus inflow.

5.2.3.3 Guidance to Address the Application Information Requirements --

The application should provide design, installation and operational data in sufficient detail to demonstrate that overtopping will be prevented. Where practices are utilized which differ from the guidance recommendations in Reference 3, it will be necessary to demonstrate that the alternative practices will provide adequate protection to prevent overtopping. A suggested attachment to the permit application is Design of System to Prevent Overtopping.

Unless fool-proof controls such as weirs are employed, it will be necessary to perform water balance studies of inflow and outflow volumes to show that adequate freeboard is available following a 100-year, 24-hour storm, considering normal variations in seasonal inflow and outflow. Changes in reservoir storage should be correlated with water level elevations in the impoundment.

Rainfall amounts for the 100-year recurrence interval storm are available from publications by the National Oceanic and Atmosphere Administration. Other analyses of precipitation, depth, duration and frequency may be available from the U.S. Geological Survey, and state and local governmental agencies.

Methods for estimating storm and seasonal runoff volumes from watershed areas have been developed by the U.S.D.A. Soil Conservation Service (National Engineering Handbook 4) and the U.S. Geological Survey in local and regional studies described in water-supply papers, professional papers, and open-file reports.

Seasonal evaporation rates should be estimated using local measurements of pond or lake evaporation, or accepted methods for calculating these losses. These include methods such as Blaney-Criddle, Thornthwaite, or Jensen-Haise, which are found in Comparison of Methods for Estimating Potential Evapotranspiration, Water Resources Series No. 59, Water Research Institute, University of Wyoming (Laramie) 1976. The flow from diversions, and normal and abnormal facility operations, should be documented and considered in the water budget analysis.

Freeboard requirements associated with waves generated by normal and extreme wind activity should be determined if freeboard could possibly fall to less than 60 cm. (2 ft). A method for evaluating wave height has been presented by the U.S. Bureau of Reclamation in Design of Small Dams (Chapter VI, 1977).

At no time may outflow from the surface impoundment be intentionally released into the environment. Methods for controlling human error or equipment malfunctions should be described. The use of emergency spillways and overflow piping, emergency collection devices, automatic control devices, and alarm systems is outlined in Reference 3.

5.2.4 Structural Integrity of Dikes

5.2.4.1 The Federal Requirement --

Section 270.17(b) requires that the Part B Permit Application include:

> Detailed plans and an engineering report describing how the surface impoundment is or will be designed, constructed, operated, and maintained to meet the requirements of §264.221. This submission must address the following items as specified in §264.221: ...(C) Structural integrity of dikes:

Section 264.221(d) states:

> A surface impoundment must have dikes that are designed, constructed, and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

5.2.4.2 Guidance to Achieve the Part 264 Standard --

Dikes must be safe and stable during all phases of construction and operation of a surface impoundment. Dikes are used as parts of surface impoundment facilities that are partially or completely above ground. Similarly, surface impoundments essentially dug into native soil are considered to include a dike-like structure subject to the above regulations. The embankment of the impoundment serves the same purpose as a dike (i.e., provides lateral structural support for the liner and prevents the impounded waste from migrating over the land surface. Therefore, these embankments should be analyzed for structural stability at least against possible failure into the impoundment, and also against external failure if the impoundment is near or along a sloping surface over which the waste could migrate after a failure. Of particular interest is the stability of the dike to preclude failures of (1) the end of construction (2) during steady-state seepage, (3) during rapid drawdown, and (4) during seismic ecvents. Evaluations, surveillance, and maintenance of dike stability are necessary to avoid environmental, property and human damage due to failure of the impounding structure.

5.2.4.3 Guidance to Address the Application Information Requirement --

Elements to be considered in the design and evaluation of dikes for stability and addressed in the application include foundation conditions, embankment materials, liner type and waste material, all of which are part of the dike system. Long-term effects of various external factors such as frost, wind, rain, and temperature, as well as man, animals, and vegetation should be considered. A suggested attachment to the permit application is a Report of Structural Integrity of Dikes.

The design and evaluation of the dikes of a surface impoundment will require the review of the results of the field and laboratory investigation programs, geologic evaluation and hydrogeologic parameters for stability analyses. The accuracy and results of analyses and evaluation of the stability of the dikes will depend mainly on the accuracy with which shear strength and slope conditions can be quantified.

Stability assessments should utilize in situ properties of the dikes and foundations, and pertinent geologic information. Foundations may present problems where they contain adversely oriented joints, slickensided or fissured material, faults, seams of soft materials, or weak layers.

Liquefaction of loose, saturated sands and silts may occur under conditions of cyclic to shear deformation by earthquake shocks (or nearby heavy construction activity). The possibility of liquefaction of dike foundation soils must be evaluated on the basis of empirical knowledge supplemented by special laboratory tests and engineering calculations.

Slope failure of the dike system, in which a portion of the dike or of an embankment and foundation moves by sliding or rotating relative to the remainder of the mass, is the major consideration in stability analyses. The most common methods of analyzing slope stability include the circular arc or the sliding wedge methods of analysis. Other methods of analysis such as those analyzing complex or non-circular failure surfaces may be appropriate, depending on the type of materials, dike configuration, subsurface conditions, and the geometry of the foundation. Many of these methods are found in the references listed below. Several computer programs for slope stability analysis are available. These include "STABR" and "SLOPE8R" which are available from the Civil Engineering Department of the University of California, Berkeley. Slope stability may also be analyzed using manual calculations or using slope stability charts such as those in the first reference listed below.

The discussion and references presented in Section 5.2.4 for the liner foundation are also applicable for dike foundations, including the subsurface exploration and laboratory testing procedures. Other references for design and evaluation and maintenance of small dams and dikes for surface impoundment include the following with the first two publications considered particularly helpful.

- Design Manual: Soil Mechanics, NAVFAC DM-7.1, Naval Facilities Engineering Command, Washington, D.C., May 1982.
- An Engineering Manual for Slope Stability Studies. Duncan, J.M., and Buchignani, A.L., Department of Civil Engineering, University of California, Berkeley, California, 1975.
- Soil Engineering, Spangler, M.G. and Handy, R.L., Harper and Row, 1982.
- Design of Small Dams. 2nd Edition Revised, Reprinted. U.S. Bureau of Reclamation, Washington, D.C., 1977. GPO Stock No. 024-003-0119-8.

- Foundation Engineering Handbook, Winterhorn, H.F., and Fang, H.V., Van Nostrant Reinhold Co., 1975.
- Closure of Hazardous Waste Surface Impoundments. SW-873, U.S. Environmental Protection Agency, Washington, D. C. GPA Stock No. 024-003-0119-8.
- Recommended Guidelines for Safety Inspection of Dams, Department of the Army, Office of the Chief of Engineers, Washington, D.C., Appendix D.
- Soil Mechanics, Lambe, T.W. and Whitman, R.V., John Wiley and Sons Inc., 1969.

The information that the applicant should develop and present includes the following:

- Topography and site conditions as required by Section 270.14(b)(19);
- Subsurface soil conditions, including ground-water levels, bedrock conditions and seismic setting of the site as discussed in Sections 5.2.4 and 9.0 of this manual.
    - Soil borings should be made in at least two locations along the long axis of each dike and include both dike and foundation materials. More locations should be sampled if soil conditions change markedly along the dike.
    - Soil borings should be made into the foundation at least as deep as the base of the dike is wide. For existing dikes, borings should be located along the centerline of the crest if possible. Borings generally need not penetrate bedrock.
    - Drilling logs should be maintained and soil samples taken at depths indicated by changes in soil type.
    - Field and laboratory tests should be conducted. Field tests should include at least visual classification and standard penetration or cone penetration tests. Laboratory tests should include at least density, moisture content, grain size distribution, permeability, and shear strength tests. Shear strength tests should be conducted to simulate the various potential slope failure modes (e.g., U-U, C-U, and D tests). Triaxial tests are recommended rather than direct shear tests.

- Design layout, sections and details of the impoundment and its components, including cover, dike, liner, drainage, leak detection system, slope protection, etc.
- A description of, and the results of, stability analyses for the following conditions:
  - -- Foundation bearing capacity failure.
  - -- Seepage induced failure (piping).
  - -- Slope failures
- Minimum factors of safety (F.S.) should be reported from slope stability analyses conducted for the following failure modes.
  - -- End of construction (proposed dikes only).
  - -- Steady-state seepage.
  - -- Rapid drawdown.
  - -- Seismic conditions.

No single, specific, minimum Factor of Safety for slope stability has been recommended. An acceptable Factor of Safety depends on the confidence with which soil data are known and the consequences of a dike failure. The matrix shown in Table 5-1 is provided as general guidance. Applicants should note that high confidence with soil data (adequate number and depth of soil borings, detailed soil sampling and analysis, and high-quality shear strength tests) may result in a lower acceptable Factor of Safety.

5.2.5 Ground-Water Protection Exemption for Double-Lined Surface Impoundments

5.2.5.1 The Federal Requirement--

If the applicant desires exemptions from the ground-water protection standards because he proposes a double-lined surface

TABLE 5-1. RECOMMENDED MINIMUM VALUES OF FACTOR OF SAFETY FOR SLOPE STABILITY ANALYSES

Consequences of Slope Failure	Uncertainty of Strength Measurements	
	Small[1]	Large[2]
No imminent danger to human life or major environmental impact if slope fails.	1.25 (1.2)[3]	1.5 (1.3)
Imminent danger to human life or major environmental impact if slope fails.	1.5 (1.3)	2.0 or greater (1.7 or greater)

[1] The uncertainty of the strength measurements is smallest when the soil conditions are uniform and high quality strength test data provide a consistent, complete, and logical picture of the strength characteristics.

[2] The uncertainty of the strength measurements is greatest when the soil conditions are complex and when the avialable strength data do not provide a consistent, complete, or logical picture of the strength characteristics.

[3] Numbers without parentheses apply for static conditions and those within the parentheses apply to seismic conditions.

impoundment, as discussed in §§264.222(a), Section 270.17(c) requires that the Part B Permit Application include:

> If an exemption from Subpart F of Part 264 is sought, as provided by §264.222(a), detailed plans and an engineering report explaining the location of the saturated zone in relation to the surface impoundment, and the design of a double-liner system that incorporate a leak detection system between the liners;

Section 264.222(a) states:

> The owner or operator of a double-lined surface impoundment is not subject to regulation under Subpart F of this part if the following conditions are met:
>
> (1) The impoundment (including its underlying liners) must be located entirely above the seasonal high water table.
>
> (2) The impoundment must be underlain by two liners which are designed and constructed in a manner that prevents the migration of liquids into or out of the space between the liners. Both liners must meet all the specifications of 264.221(a).
>
> (3) A leak detection system must be designed, constructed, maintained, and operated between the liners to detect any migration of liquids into the space between the liners.

5.2.5.2 Guidance to Achieve the Part 264 Standard --

The design and operating standards contain special sets of standards for surface impoundments with double liners and a leak detection system. These standards are not mandatory. However, if an applicant voluntarily applies for and is issued a permit to comply with these special standards (in addition to the other standards generally applicable to these units), then he is not subject to the ground-water protection regulations contained in Subpart F of Part 264. To be eligible for exemption from the ground-water protection requirements, a double-lined unit (including the liner and leak detection system) must be placed entirely above the seasonal high water table.

A leak detection system is any system (a drain and pump or appropriate instrumentation) that enables the permittee to detect whether any liquid has entered into the space between the liners. This is the means by which it can be determined if the liner has failed or is leaking. Some water may enter the space between the liners at the time of installation. This would occur only once, at the time of unit start-up. A prudent permittee should remove this water immediately, since the presence of water in the leak detection system after the unit has begun to receive waste will be assumed to indicate that one of the liners is leaking. Failure or leakage of the liner requires the permittee to notify the Regional Administrator, initiate the site contingency plan, and to either repair the primary liner or institute ground-water monitoring pursuant to §264.98.

Ordinarily, a permit written for a double-lined unit seeking an exemption from the ground-water protection requirements would not contain any detection monitoring requirements. In that case, if the permittee discovers a leak in the leak detection system, he will have to repair or replace the leaking liner or be in violation of the permit. Therefore, EPA recommends that those who anticipate retrofitting problems in attempting to repair or replace leaking liners should request that detection monitoring programs be established in their permits, in accordance with the requirements of §264.98, as contingent requirements. Such requirements would be automatically triggered in the event of a leak, but would not have to complied with unless such a leak occurred. The contingency plan within the permit would specify monitoring well placement, detection parameters to be monitored, and the frequency of sampling. If a leak in the top liner occurred, the permittee would then install the wells and begin a ground-water monitoring program in accordance with a schedule set forth in the permit. See Reference (3) for further discussion of this issue.

5.2.8.3 Guidance to Address the Application Information Requirement --

A surface impoundment must not be located within the saturated zone in order to qualify for this exemption. Many fine-grained geologic formations may not meet the characteristics of an aquifer, but may be nonetheless saturated. An impoundment constructed in such a formation would be below the ground-water table, and could not qualify for the exemption.

The applicant should submit the following information if he is applying for the ground-water exemption for double-lined units.

- A demonstration that the impoundment and its underlying liners will be located entirely above the seasonal high ground-water table. The applicant should refer to Section 9.3 of the manual for guidance on how to describe the hydrogeologic characteristics of the facility's location.
- A demonstration that both liners satisfy the requirements of §264.221(a)(1). The applicant should refer to Section 5.2.1 for guidance on how to demonstrate compliance with this standard for each liner. For those cases in which

two different types of liner materials are to be used, a liner integrity analysis (i.e., waste-liner capability test) for both liners must be submitted.

- A demonstration that the leak detection system between the two liners will be designed, constructed, maintained, and operated to detect any migration of liquid into the space between the liners. EPA recommends that the leak detection system resemble a leachate collection and removal system. If the top liner leaks, a leachate collection and removal system will be present beneath it for immediate operation. The applicant can refer to Section 8.2.2 for guidance on leachate collection and and removal system design.

A suggested attachment to the permit application is a Report Supporting Request for Exemption from Ground-Water Protection Requirements for Double-lined Surface Impoundments.

5.3 MONITORING AND INSPECTION

5.3.1 Monitoring and Inspection During Construction and Installation

5.3.1.1 The Federal Requirement --

Section 270.17(d) requires that the Part B Application include:

> A description of how each surface impoundment, including the liner and cover systems and appurtenances for control of overtopping, will be inspected in order to meet the requirements of §264.226(a) and (b). This information should be included in the inspection plan submitted under §270.14(b)(5);

Section 264.226(a) states:

> During construction and installation, liners (except in the case of existing portions of surface impoundments exempt from §264.221(a)) and cover systems (e.g., membranes, sheets, or coatings) must be inspected for uniformity, damage, and imperfections (e.g., holes, cracks, thin spots, or foreign materials). Immediately after construction or installation:
>
> (1) Synthetic liners and covers must be inspected to ensure tight seams and joints and the absence of tears, punctures, or blisters; and

(2) Soil-based and admixed liners and covers must be inspected for imperfections including lenses, cracks, channels, root holes, or other structural non-uniformities that may cause an increase in the permeability of the liner or cover.

5.3.1.2 Guidance to Achieve the Part 264 Standard --

Synthetic liner and cover systems must be inspected during construction and installation for uniformity, damage and imperfections, and after installation to insure tightness of seams and joints, and absence of tears, punctures, or blisters. Soil-based and admixed liners and covers must be inspected for imperfections including lenses, cracks, channels, and root holes or other structural non-uniformities that may adversely affect the permeability, strength, or other engineering properties of the liner or cover. The applicant should consult the EPA publication on liners (Reference 3) for information on specific inspection needs and objectives for various liners. Information on evaluating cover systems is also available in Reference 5.

An effective quality control program will form the basis for the inspection plan for the installation and construction of liners. The applicant should propose a Liner Installation Quality Control Program (QC) that addresses the proposed methods of liner inspection, testing, and documentation. This QC Program should be inclued in the construction Inspection Plan, noted in Section 5.3.1.3. The QC Program may be developed, in part, from manufacturer's standard inspection procedures. For example, for a synthetic liner, it should include, but not be limited to, the following specific provisions:

- The permittee will designate a field representative (OC Manager) with sole responsibility for inspection and approval of liner work. For large projects, the permittee should provide a sufficient number of personnel to assist the OC Manager to achieve the objectives of the OC Program.

- OC Program should include assurance that the following objectives are met:

  -- The construction specifications required in the permit are fully implemented.

  -- Subgrade preparation is consistent with requirements for synthetic liner membranes.

  -- Handling of liner materials is performed in accordance with manufacturer's recommended procedures.

  -- Manufactured liner panels, upon arrival at the project site, are free of product defects and damage resulting from shipping.

  -- Fabricated seams of prefabricated sheet membranes are tested by airlance, vacuum, or other suitable means to determine location of defects.

  -- Liquid-applied membranes, adhesives, and solvents are delivered in sealed containers and are used in accordance with the manufacturer's recommendations.

  -- Contractor's tools are consistent with manufacturer's recommendations; sharp instruments such as pointed scissors are not allowed.

- Field seams constructed by adhesive, heat, welding or other means are tested by airlance, vacuum, ultrasonic or by any combination of methods to determine the location of defects.

- Placement of soil and protective cover is accomplished so that the soil is free of deleterious materials, and in a manner such that damage is not caused to the liner membrane by disposal operations.

- Samples of liner material, fabrication seams, and field seams are taken routinely in sufficient number to verify the quality of workmanship of the completed work.

- Laboratory testing of field samples is conducted in accordance with ASTM standards and procedures for synthetic liner membranes. Results should be reviewed by the OC

Manager and corrective action taken if materials and seams do not meet minimum specified strengths. The permittee should notify the Regional Administrator of such corrective action and make all test results available for review upon request.

- Documentation of all phases of the OC Program should be prepared by the permittee for record purposes. Daily reports should be maintained by the OC Manager describing observations, activities, weather, production, contractor's equipment, and work force specific problems. Deviations from standard construction procedures by the contractor, and corrective measures and changes in design should be fully documented. Location of field samples and laboratory test results should be made a part of program documentation. Soil-based and admixed liners and covers must be inspected. As-built conditions of each day's work should be recorded.

Soil-based and admixed liners and covers must be inspected and tested to ensure that they are properly constructed according to the approved design. The test data should consist of strength, permeability, and other material properties of samples representative of the liner or cover to be used in construction. Actual waste fluid or the equivalent should be used whenever appropriate in the tests.

To ensure that the liner and cover system are constructed according to the approved design and specifications, and to ensure uniformity, absence of damage and imperfections, an independent test lab and inspector supervised by a qualified, registered engineer should be present at all phases of construction and installation to monitor and test the materials as they are placed. Non-destructive or destructive sampling and testing should be performed on a random basis in accordance with established, acceptable standards. In destructive sampling and testing, the areas sampled or tested should be restored to original condition immediately following the procedure. All test results and other pertinent data, such as location, elevation, date, climatic conditions, personnel, etc., should be documented and kept on record.

The applicant is advised that additional general inspection requirements are delineated in §264.15(b) of the general facility standards. The corresponding permit information requirements for these requirements are provided in §270.14(b)(5). Guidance on these overall inspection requirements will be provided in the permit applicants' Guidance Manual for General Facility Standards, Reference (1).

5.3.1.3 Guidance to Address the Application Information Requirement --

The following information on inspections should be submitted with the permit application. The applicant should include this information in the overall facility inspection plan as required under the General Facility Requirements. A suggested attachment to the permit application is Construction Inspection Plan.

- Describe procedures, including a quality control program, for inspecting synthetic liners and covers during construction and installation. The applicant should address all inspection needs discussed above for synthetic liners and covers.
- Describe procedures, including a quality control program, for inspecting soil-based and admixed liners and covers during construction and installation. The applicant should address all inspection needs discussed above for soil-based and admixed liners and covers.
- Describe procedures for assuring that dike construction specifications are met (e.g., lift thickness, compaction, and moisture content of dike materials).

5.3.2 Monitoring and Inspection During Operation

5.3.2.1 The Federal Requirement --

Section 264.226(b) states:

> While a surface impoundment is in operation, it must be inspected weekly and after storms to detect evidence of any of the following:
>
> (1) Deterioration, malfunctions, or improper operation of overtopping control systems;
>
> (2) Sudden drops in the level of the impoundment's contents; and
>
> (3) The presence of liquids in leak detection system, where installed to comply with §264.222; and
>
> (4) Severe erosion or other signs of deterioration in dikes or other containment devices.

5.3.2.2 Guidance to Achieve the Part 264 Standard --

Qualified personnel must make weekly inspections of the surface impoundment while it is in operation. Inspectiooons should also be made after storms and earthquakes. A detailed written inspection schedule should be developed and submitted to the EPA for evaluation with the permit application. Detailed guidance on inspections are provided in the Permit Applicant's Guidance Manual for the General Facility Standards.

5.3.2.3 Guidance to Address the Application Information Requirement --

A suggested attachment to the permit application is Operating Inspection Plans. The following issues must be addressed to meet the requirements for inspection [§264.15(b)]:

(1) The owner or operator must develop and follow a written schedule for inspection monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment (such as dikes and sump pumps) that are important to preventing, detecting, or respondin to environmental or human health hazards.

(2) The schedule must identify the types of problems (e.g., malfunctions or deteriation) which are the subject of the inspection (e.g., inoperative sump pump, leaking fittings, eroding dikes, etc.).

(3) The frequency of inspection may vary for the items on the schedule. However, it should be based on the rate of possible deterioration of the equipment and the probability of an environmental or human health incident if the deterioration or malfucntion of any operator error goes undetected between inspections. At a minimum, the inspection schedule must include the terms and frequencies called for in §264.226.

In addition to an overall assessment of the surface impoundment, the inspection records should include the maintenance and calibration records of any control systems and leak detection systems. All information from each inspection should be documented and kept on record for Agency review. Some form of checklist is recommended. It should provide for narrative comments that can fully describe unusual or unexpected observations.

The inspection plan should provide for thorough examination of the dike embankment for any signs that indicate potential instability, maintenance deficiencies, or other conditions that are either the result of or may lead to adverse dike performance. Generally, the following items should be considered:

- Cracks in the crest, embankment slopes, or abutment and toe areas.
- Settlement, depressions or sink holes on the embankment or downstream toe area.
- Movement resulting in irregularities in alignment or non-uniformity of slopes, such as slides, sloughs, or bulges.
- Erosion by surface run-off, seepage, or irrigation on the crest, slope abutment contact and downstream toe area, and erosion by wave action on the upstream slope.

- Seepage on the embankment slopes, abutment and foundation contacts, and downstream area, including boils.
- Damp areas on the downstream slope, abutments and downstream toe area.
- Animal burrows, trees, and brush growth on crest, slopes, abutment and toe areas that could cause detrimental seepage or obstruct areas from inspection.
- Conditions of upstream slope and crest paving, including weed growth and signs of distress.
- Condition of surface drainage facilities and their ability to prevent erosion or ponding.

The spillway(s) should be inspected for the following:

- Condition of the approach channel, crest, and downstream channel areas.
- Obstruction and debris at the spillway crest, or anywhere in the channel.
- Condition of slopes above the channel that could slide or slough, particularly during rain or spillway flow, and deposit debris in the channel.
- Signs of seepage or damp areas in the channel.

Instrumentation and monitoring points associated with the surface impoundment should be included in the plan and the following examined.

- Condition and accessibility of piezometers or observation wells at the surface.
- Condition and accessibility of surface survey monuments.
- Condition and accessibility of the leak detection monitoring points, particularly their ability to flow freely and to function properly. The clarity of the discharge water should be observed to detect any material being carried with the flow.

The inspection plan should include preparation of a report summarizing the observations made on the condition and performance of the dike system, and listing those items requiring maintenance or remedial work. This report should become part of the operating record of the facility. Items that require special examination in future inspections must be described. Information on major adverse conditions, potentially adverse conditions, or questionable conditions should be properly documented.

5.4 Dike Certification by a Qualified Engineer

5.4.1 The Federal Requirement --

Section 270.17(e) requires that the permit application include:

> A certification by a qualified engineer which attests to the structural integrity of each dike, as required under §264.225(c). For new units, the owner or operator must submit a statement by a qualified engineer that he will provide such a certification upon completion of construction in accordance with plans and specifications;

Section 264.226(c) states:

> Prior to the issuance of a permit, and after any extended period of time (at least six months) during which the impoundment was not in service, the owner or operator must obtain a certifcation from a qualified engineer that the impoundment's dike, including that portions of any dike which provides freeboard, has structural integrity. The certification must establish, in particular, that the dike:

(1) Will withstand the stress of the pressure exerted by the types and amounts of wastes to be placed in the impoundment; and

(2) Will not fail due to scouring or piping, without dependence on any liner system included in the surface impoundment construction.

5.4.2 Guidance to Achieve to Part 264 Standards

The certification must, at a minimum, cover two aspects of structural integrity: (1) the force exerted on the dike by the contents of the impoundment, and (2) the dike's resistance to scouring and piping in the event that the liner leaks. The former ensures that the dike will not collapse or be swept away simply as a result of the pressure exerted against it by its contents. The latter assures that the dike will not collapse or be washed away if liquid begins to seep through it. While seepage through a dike is important from the standpoint of its inherent pollution potential, it also can cause the dike's constituents (usually soil) to become more fluid, to move, and to flush through, creating a hole and massive collapse. Although evaluations of structural integrity are not foolproof, the Agency believes that an evaluation and certification provides an important measure of protection.

5.4.3 Guidance to Address the Application Information Requirement

To demonstrate the structural integrity of the dike, the following analyses, tests and inspections should be performed by the qualified, registered engineer and presented in a certification of the dike's stability. A suggested attachment to the permit application is Dike Certification.

- A review of all the geologic, geotechnical, geohydrologic and other pertinent design, construction and service data.
- A review of all climatic data, and special geologic events, such as earthquakes, which occur during the entire period the impoundment was in service.

- A field inspection to detect signs of settlement, subsidence, cracks, scouring, erosion, slides, holes, piping, seepage, sloughing, condition of vegetation, etc.
- Field measurements, including fluid levels in monitoring wells leak detection systems, and a horizontal and vertical movement survey;
- Samples should be taken from monitoring wells, leak detection systems for testing and analysis. Any electrical system, pumping and all monitoring systems, leachate collection and detection systems should be tested for their proper functioning; any corrosion or malfunctions should be noted and repaired;
- Comparison of the measurements, inspection and testing results to the original design; a determination of the causes of any potentially adverse observations and measurements. These may be supplemented with a field investigation program such as sampling through cover, waste, liner, and foundation soil and rocks, if necessary; and
- A determination if the original design was adequate and a review of possible changes from parameters used in the original design. A re-analysis based on revised parameters and re-estimation of the remaining useful life of the impoundment may be necessary.

Cracks, slumps, slides and other movement in the dike and at its foundation and abutment contacts are all evidence of instability. Their location, extent, pattern, and direction indicate the likelihood of actual instability. Their occurrence on the crest or slopes may warn of impending failure and signal the engineer. Further guidance concerning appropriate inspection activities to be conducted as part of the dike certification procedure may be found in Section 5.3.2.3.

In addition to the field evaluations and inspections of a dike, several other phases are involved in the evaluation and certification of dike stability. The initial phase is the compilation and review of available geotechnical and construction data. Depending upon the results of the data review and field inspection, additional technical investigations may be necessary. An evaluation of the stability of the dike system is then made from the compiled data. If the dike is considered to be unstable, recommendations should be made to repair or modify the structure. If the dike is considered to be stable, a plan for future surveillance and monitoring should be developed and included in the application. Guidelines for the data review, reconnaissance, investigations, engineering analysis, and continued surveillance of dikes for stability are contained in Section 5.2.4.

The application should include all technical data and calculations in addition to the qualified, registered engineer's statement attesting to the stability of the dike. In the case of new units, a statement from a qualified, registered engineer should be provided stating that the unit will be certified upon completion of construction.

5.5 REMOVAL OF IMPOUNDMENT FROM SERVICE

5.5.1 The Federal Requirement

Section 270.17(f) requires that the permit application include:

> A description of the procedure to be used for removing a surface impoundment from service, as required under §264.227(b) and (c). This information should be included in the contingency plan submitted under paragraph (a)(7) Section §264.227(a) through (c) state:
>
> (a) A surface impoundment must be removed from service in accordance with paragraph (b) of this section when:
>
> (1) The level of liquids in the impoundment suddenly drops and the drop is not known to be caused by changes in the flows or into or out of the impoundment; or

(2) The dike leaks.

(b) When a surface impoundment must be removed from service as required by paragraph (a) of this section, the owner or operator must:

(1) Immediately shut off the flow or stop the addition of wastes into the impoundment;

(2) Immediately contain any surface leakage which has occurred or is occurring;

(3) Immediately stop the leak;

(4) Take any other necessary steps to stop or prevent catastrophic failure;

(5) If a leak cannot be stopped by any other means, empty the impoundment; and

(6) Notify the Regional Administrator of the problem in writing within seven days after detecting the problem.

(c) As part of the contingency plan required in Subpart D of this part, the owner or operator must specify a procedure for complying with the requirements of paragraph (b) of this section.

5.5.2 Guidance to Achieve the Part 264 Standard

Section 264.227(a) requires removal of an impoundment from service when the level of liquids in the impoundment drops suddenly and the drop is known to not be caused by changes in the flows into or out of the impoundment. In such a case, rapid discharge through the liner must be presumed. For example, it may be that the liner is leaking and that channels in the underlying have been formed and soils are permitting rapid migration of wastes out of the impoundment. EPA anticipates that these circumstances will occur infrequently.

A second and probably more likely situation requiring removal from service is a leaking dike. This indicates the potential for massive dike failure. The Agency believes immediate action is necessary in the event active leakage is discovered. Minor deterioration of the dike (e.g., erosion) which can be easily repaired would not require the removal of the impoundment from service.

If a surface impoundment must be partially or completely emptied, caution should be taken in order that the dike does not experience a rapid drawdown failure. It is recommended that the level of the liquid generally not be lowered by more than one foot per day; more rapid drawdown could induce a failure with catastrophic results.

If an existing impoundment which is exempted from the liner requirements, has experienced a sudden drop in liquid level, then a liner that complies with §264.221 or §264.222 must be installed prior to its return to service. Due to the possibility of failure of the impoundment, installing a liner is absolutely essential to ensure that substantial leakage and contact with ground water will not occur in the future.

If the impoundment is not returned to service, §264.227(e) requires that it must be closed in accordance with the provisions of §264.228. This requirement is necessary to assure that the failed impoundment is not left with liquid wastes in it for an unnecessary period of time.

5.5.3 Guidance to Address the Permit Application Requirement

A suggested attachment to the permit application is Contingency Plan to Remove Surface Impoundment from Service.

The applicant should submit the following information, as a minimum.

- A description of how the wastes will be stopped from being placed in the impoundment.
- A description of emergency plans and equipment that will be employed in order to contain any surface leakage and stop the leak.
- A description of how the impoundment will be emptied, if necessary. This should also include an estimate of how long it will take to empty the impoundment, where the impounded wastes will be placed and the capacities of on-site units that will be used for containing the impoundment's contents. Note that on-site units that are used only to store hazardous wastes under emergency conditions need not be permitted under RCRA; however, it is recommended that they be designed, installed, and operated in accordance with Part 264 standards.

5.6 CLOSURE AND POST-CLOSURE CARE

5.6.1 Closure of Storage Impoundments

5.6.1.1 The Federal Requirement --

Section 270.17(g) requires that the application include:

> A description of how hazardous waste residues and contaminanted materials will be removed from the unit at closure, as required under §264.228(a)(1).

Section 264.228(a)(1) states:

> At closure, the owner or operator must:
>
> (1) Remove or decontaminate all waste residues, contaminated containment system components (liners, etc.) contaminated sub-soils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste unless §261.3(d) of this chapter applies;...

5.6.1.2 Guidance to Achieve the Part 264 Standard --

In order to close a storage impoundment, all wastes, waste residues, contaminated system components such as liners, contaminated subsoils, and contaminated structures and equipment must be removed or decontaminated. This is necessary because no post-closure care or monitoring is required. All the removed residues, subsoils; and equipment must be managed as hazardous wastes unless the provisions of §261.3(d) are complied with.

If the permittee makes all reasonable efforts to comply with the regulations (e.g., he removes or decontaminates all waste and waste residue above the liner as well as some contaminated subsoil) and then finds that he cannot comply with his closure plan because he is unable to remove or decontaminate all of the remaining subsoils he must close the unit as a disposal impoundment and perform post-closure care. This situation is likely to occur in the case of existing portions that do not have liners or adequate liners. Contamination may have migrated a considerable distance from the impoundment and possibly even entered the ground water. This situation necessitates closure under the second alternative to minimize the rate of migration and monitor for potential ground-water contamination. In contrast, facilities with good liners that do not fail will be able to avoid post-closure responsibilities. The applicant should refer to Reference 3 and 6.

The regulations cited above establish two sets (1) things that are hazardous wastes and (2) things that are only contaminated. Hazardous wastes must be removed and managed as hazardous wastes. Contaminated materials may not be polluted to such a degree as to constitute hazardous wastes, but must be managed as such unless they can be shown to be exempt via §261.3(d).

The Agency has considered the degree to which a permittee must remove or decontaminate subsoils, and so forth from storage impoundments. It considers that the requirements of §264.228(a)(1) will be complied with when the remaining subsoil contains hazardous constituents at concentrations no greater than those of the same subsoil prior to installation of the impoundment, i.e., not greater than background levels.

If the applicant anticipates attempts to demonstrate compliance, he should include plans to sample and analyze subsoil and report the results in the permit application. These plans should indicate the location, depth, and methods to be used in sample acquisition. The analytical results may be accepted as the background levels that must be met as a criteria for closure of a storage impoundment.

The Agency believes that a three-layer final cover (cap) will adequately minimize infiltration of precipitation, which is the primary purpose of the final cover. The final cover acts to minimize infiltration by causing precipitation to run off through use of slopes, drainage layers, and impermeable and slightly permeable barriers. Other functions of the final cover include prevention of: contamination of surface run-off, wind dispersal of hazardous wastes, and direct contact with hazardous wastes by people and animals straying onto the site. For guidance on an acceptable final cover, the applicant should refer to Reference 5.

To prevent the "bathtub effect," i.e., to prevent the impoundment from filling with leachate after closure, the final cover must be no more permeable than the most impermeable component of the liner system (or of the underlying soils). In this way, no more precipitation is allowed to infiltrate the impoundment than can escape through the bottom liner. Prevention of the "bathtub effect" is important so as to eliminate the possibility of surface overflow or migration through porous surface strata.

The final cover should be designed to accommodate pressures resulting from gas generated within the wastes. The cover should either withstand these pressures and retain the gases; or preferably, the gases should be safely vented to the atmosphere. The design shall include a discussion of the potential for gas generation and include features to manage the gas. (See the discussion about gas in Section 8.2.1.2.)

5.6.1.3 Guidance to Address the Application Information Requirement --

A suggested attachment to the permit application is Closure Plan for Storage Impoundment. The applicant should submit for review a description of the fate of the hazardous wastes, contaminated sludges, soils, liners, and equipment at the time of closure. Such materials must either be treated or decontaminated to render them nonhazardous, or transferred to a permitted hazardous waste management facility capable of properly managing those materials. The applicant should describe the specific testing that will be used to determine if the soil liner or other components are hazardous. The applicant should state how he is going to determine the depth to which the hazardous constituents have migrated into any liner.

The application should include a description of methods to be used to remove wastes and contaminated materials, treat hazardous waste and residues at the site, and decontaminate equipment as appropriate. This description may include:

- Methods for removing liquids, sludges, liners and contaminated soils (e.g., excavation of soil liners with a backhoe).
- Equipment requiring decontamination and decontamination methods to be used (e.g., steam cleaning of backhoes).
- Listings of equipment and supplies required to conduct closure (e.g., specific chemicals, bulldozers, and vacuum trucks) indicating those supplies and equipment currently available at the facility.

For an existing facility, the applicant should submit a contingency closure plan (i.e., the information that is needed for closure of a disposal impoundment Section 5.6.2). This requirement is for impoundments not designed in accordance with §264.221(a) nor exempted by §264.221(b). The regulations anticipated that some existing surface impoundments without adequate liners will not be able to meet (economically meet) the closure requirements for a storage facility. Such units will then have to be closed as disposal surface impoundments with the associated cover, ground-water monitoring, post-closure care, etc. requirements. Therefore, applicants for existing storage units should plan (as a contingency) how the unit will be closed as a disposal unit. Also note that the financial assurance requirements of the General Facilities Standards requires the cost estimate for the contingent closure plan, not the anticipated, normal closure plan. It was assumed that closure as a disposal unit would cost more than closure as a storage unit; therefore, the higher cost is to be included for financial assurance considerations.

5.6.2 Closure of Disposal Impoundments

5.6.2.1 The Federal Requirement --

Section 122.25(b)(3)(vii) requires that:

> ....For any wastes not to be removed from the unit upon closure, the owner or operator must submit detailed plans and an engineering report describing how §264.228(a) and (b) will be complied with. This information should be included in the closure plan and, where applicable, the post-closure plan submitted under §270.14(b)(13):

Section 264.228(a)(2) requires the facility to:

(2)(i) Eliminate free liquids by removing liquid wastes or solidifying the remaining waste residues;

ii) Stabilize remaining wastes to increase bearing capacity to a sufficient degree to support final cover; and

(iii) Cover the surface impoundment with a final cover designed and constructed to:

(A) Provide long-term minimization of the migration of liquids through the closed impoundment;

(B) Function with minimum maintenance;

(C) Promote drainage and minimize erosion or abrasion of the final cover;

(D) Accommodate settling and subsidence so that the cover's integrity is maintained; and

(E) Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

5.6.2.2 Guidance to Achieve the Part 264 Standard --

Closure of a disposal surface impoundment requires several steps. First, free liquids must be eliminated by removing liquid wastes and/or solidifying the remaining waste residues. This is an important step in minimizing the rate of leachate migration.

Second, the remaining wastes must be stabilized to such a bearing capacity as will support final cover, including the top liner and earth materials placed above that liner to protect the liner, allow the growth of shallow-rooted vegetation, and promote drainage. Failure to do so is likely to result in substantial differential settlement of the final cover over time, thereby creating channels through which liquids can enter the impoundment and eventually leach the waste constituents into the ground water. Stabilization does not necessarily refer to patented or other commercial processes to fix or stabilize wastes.

Third, a final cover must be placed over the closed impoundment. The cover must be designed and constructed to provide long-term minimization of the migration of liquids into the closed impoundment. In addition, the cover must have a barrier layer with hydraulic conductivity no greater than that of the bottom liner.

The final cover must also be designed to minimize erosion, since erosion would result in exposure of the covered wastes and increased infiltration. Such protection is provided by proper sloping, cover with appropriate vegetation, and other construction techniques. Finally, the cover must accommodate settling and subsidence so that its integrity is maintained.

For additional guidance the applicant should see Guide to the Disposal of Chemical Stabilized and Solidified Wastes (Reference 7).

5.6.2.3 Guidance to Address the Application Information Requirement --

A suggested attachment to the permit application is Closure Plan for Disposal Surface Impoundment. The application should include specific information concerning free liquids and waste stabilization as follows:

- Detailed information on how free liquids will be removed or solidified.
- Detailed plans describing how the wastes will be stabilized.
- Results from analyses showing that the stabilized wastes will provide sufficient, permanent support for the cover and other expected loadings. Representative samples of the waste, obtained as described in Reference 2 and in Section 5.2.2.3 of this manual, should be subjected to the stabilization/solidification technique chosen and the product analyzed to determine its bearing strength. The bearing strength should be shown, through engineering calculations and supporting laboratory tests, to be sufficent to support the maximum anticipated loadings that could result from other wastes, the cover, and construction equipment that will be employed to close the facility.
- The unconfined compressive strength and consolidation charaateristics of the stabilized waste should be determined using ASTM method D2116-66 or the U.S. Army's method presented in Appendix VII of Engineering and Design - Laboratory Soils Testing, publication number EM 1110-2-1906, or an equivalent method.

The applicant should also submit the following information:

- If a design other than that defined by EPA in Reference 5 is used, submit engineering calculations to show that the proposed cover will provide long-term minimization of migration of liquids through the closed impoundment. The applicant should demonstrate that infiltration is equivalent to or less than the cover design provided in Reference 5. The use of the HELP model is suggested (See Reference 9).

- Demonstrate that the cover system will function effectively with minimum maintenance. For example, data should be provided showing that the vegetative cover crop is adapted to regional conditions and is able to thrive with minimal irrigation or fertilization.
- Provide the following information concerning drainage and erosion:
    - Data demonstrating that the proposed slopes will not cause significant erosion of the final cover. (The USDA Universal Soil Loss Equation may be used in this demonstration.) This equation is described in Reference 5 and should be used when proposed slopes do not conform to the Reference 5 policy.
    - Description of the material in the drainage layer of the final cover that will be used, including the type and permeability of the material.
    - Engineering calculations and designs showing that precipitation will drain freely to the side.
    - Data addressing the potential for clogging of the drainage layer. The use of the Army Corps of Engineers clogging criteria formulas described in Reference 4 is recommended.
- Submit the following information concerning settlement and subsidence:
    - Data addressing the potential for settlement due to consolidation of the foundation. This analysis should consider immediate settlement, primary consolidation, secondary consolidation and creep, and liquefaction. The immediate (compression) settlement should consider the strength and elastic properties of the foundation soils. The primary and secondary consolidation should be estimated based on consolidation tests performed on undisturbed soil samples. Settlement due to creep or liquefaction should also be estimated for the slopes and bottom of a landfill, if the subsurface soils are susceptible to creep or if there is a potential for liquefaction of the foundation soils.

- -- Data addressing the potential for settlement due to consolidation of the soil-type liner. This analysis should consider the same factors as described above for foundation consolidation. Analysis of settlement due to consolidation of the soil-type liner may be similar to that for the foundation, except that liquefaction potential for the filter and drain materials above or underlying the liner should also be considered in the analysis.

- -- Analysis of settlement due to the compression of the impounded waste material should consider the following conditions: dewatering of waste material, biological oxidation of organics, and chemical conversion of solid to dissolved waste.

- -- Analysis of settlement due to any further dewatering of waste material should consider the evaporation, drainage conditions, and fluidity and homogeneity of the waste material. The settlement due to consolidation under the weight of the waste and the cover may be analyzed based on consolidation test results performed on undisturbed representative waste sediment samples in the impoundment. Both primary and secondary consolidation settlement shall be estimated. For nonhomogeneous, unsaturated, compacted or uncompacted waste sediments, the settlement analysis should take into consideration stress-induced collapse of voids within the waste material. To accommodate the amount of settlement, the placement of the cover should be scheduled accordingly.

- -- Settlement due to biological oxidation of organics may be calculated by assuming that one (1) pound of organic matter will be destroyed for each two (2) pounds of oxygen consumed in the BOD test. Settlement potential for dissolution of waste due to chemical conversion should be tested by performing chemical leaching on the waste materials.

- -- Information addressing the effects of freeze/thaw on the integrity of the proposed cover.

- -- Data on the effects of subsidence/settlement on the ability of the final cover to minimize infiltration.

- Clearly document that the final cover has a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present. This item can simply point out permeability data for the liner and cover systems attached to the application.

- Discussion of the effects on the final cover due to freeze/thaw. The applicant should demonstrate that the synthetic liner in the final cover is located wholly below the average depth of the frost penetration in the specific area.

The attached Closure Plan should contain the raw data, assumptions, calculations, drawings, and specifications necessary to support the analysis of the final cover's ability to meet the requirements. Specifically, the design of the cover should include:

- Detailed drawing(s) of the proposed layers in the final cover, including such items as the thickness of each layer, and the dimensions of the cover system.
- The common name, species, and variety of the cover crop to be established.
- A description of the synthetic liner that will be used in the final cover, including the type of synthetic liner, its chemical properties, and the manufacturer's specifications of its physical strength and thickness. An explanation of why the synthetic liner was selectd should also be provided.
- Descriptions of any protective materials placed above and below the synthetic liner and specification of the type of material.
- Characteristics of any clay layer placed beneath the liner in the final cover (including thickness and permeability).
- The construction plans for the clay layer.
- Analysis of surface drainage and discussion of erosion control.
- Installation procedures for each layer of the cover with emphasis on installation of the synthetic membrane.
- Specifications for the drainage layer including hydraulic conductivity.

5.6.3 Post-Closure Care of Disposal Impoundments

5.6.3.1 The Federal Requirement --

Section 264.228(b) states:
(b) If some waste residues or contaminated materials are left in place at final closure, the owner or operator must comply with all post-closure requirements contained in §§264.117 - 264.120, including maintenance and monitoring throughout the post-closure care period (specified in the permit under §264.117). The owner or operator must:

(1) Maintain the integrity and effectiveness of the final cover including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events;

(2) Maintain and monitor the leak detection system in accordance with §264.222, where such a system is present between double liner systems;

(3) Maintain and monitor the ground-water monitoring system and comply with all other applicable requirements of Subpart F of this part; and

(4) Prevent run-off from eroding or otherwise damaging the final cover.

5.6.3.2 Guidance to Achieve the Part 264 Standard --

Post-closure care must be continued for 30 years after the date of completing closure unless the Regional Administrator establishes a different period. Post closure care consists of maintaining the final cover and performing monitoring, and response, as necessary, to prevent adverse impacts on human health and on the environment. The frequency of monitoring and maintenance activities should be balanced with the specific factors considered in the initial closure design (i.e., climate, waste type, soil, vegetation, etc.).

5.6.3.3 Guidance to Address the Application Information Requirements --

The applicant should submit a list of planned activities that will be conducted in order to comply with the post-closure care requirements. A suggested attachment to the permit application is Post-Closure Care Plan. At a minimum, the plan should include the following:

- Frequency of inspection of the closed facility and what will be inspected.
- Remedial action plans describing how deterioration of the final cover will be remedied (e.g., reestablishing the vegetated layer).
- Frequency with which the monitoring devices will be sampled and constituents monitored.
- The design of run-on controls and the inspection of these controls in order to prevent erosion of the final cover.

For further guidance, the applicant is referred to EPA Publication No. SW-867, Evaluating Cover Systems for Solid and Hazardous Waste, September 1982, Chapter 4.

5.7 SPECIAL REQUIREMENTS FOR IGNITABLE OR REACTIVE WASTE

5.7.1 The Federal Requirement

Section 270.17(h) requires that the Part B permit application include:

> If ignitable or reactive wastes are to be placed in a surface impoundment, an explanation of how §264.229 will be complied with;

Section 264.229 states:

> Ignitable or reactive waste must not be placed in a surface impoundment, unless:
>
> (a) The waste is treated, rendered, or mixed before or immediately after placement in the impoundment so that:

(1) The resulting waste, mixture, or dissolution of material no longer meets the definition of ignitable or reactive waste under §261.21 or 261.23 of this chapter; and

(2) Section 264.17(b) is complied with; or

(b) The waste is managed in such a way that it is protected from any material or conditions which may cause it to ignite or react; or

(c) The surface impoundment is used solely for emergencies.

5.7.2 Guidance to Achieve the Part 264 Standard

The regulations require the permittee to take precautions to prevent accidental ignition or reaction of ignitable or reactive wastes and to protect the waste from sources of ignition.

5.7.3 Guidance to Address the Application Information Requirement

Suggested attachment(s) to the permit application are Ignitable and/or Reactive Waste Management Plan(s). The applicant should provide at least the following information:

- Description of how ignitable or reactive wastes will be identified when received at the site (should also be included in the Waste Analysis Plan).

- Description of the procedure for treating or mixing the ignitable or reactive wastes before or immediately after placement in the impoundment.

- Results of laboratory or field experiments that demonstrate that after treatment or mixing and placement in the impoundment, the reactive or ignitable waste will be rendered non-reactive or non-ignitable.

- Description of how §264.17(b) will be complied with (i.e., describe what precautions will be taken to prevent reactions which: (1) generate extreme heat or pressure, fire or explosions, or violent reactions; (2) produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment; (3) produce uncontrolled,

> flammable fumes or gases in sufficient quantities to pose a risk of fire or explosion; (4) damage the structural integrity of the device or facility, and (5) through other like means threaten human health or the environment).

Additional guidance on the ignitable and reactive waste information needs is provided in Reference 1.

5.8 SPECIAL REQUIREMENTS FOR INCOMPATIBLE WASTES

5.8.1 The Federal Requirement

Section 270.17(i) required that the Part B application include:

> (ix) If compatible wastes, or incompatible wastes and materials will be placed in a surface impoundment, an explanation of how §264.17 will be complied with.

Section 264.230 states:

> Incompatible wastes, or incompatible wastes and materials, (see Appendix V of this part examples) must not be placed in a surface impoundment, unless §264.17(b) is complied with.

5.8.2 Guidance to Achieve the Part 264 Standard

The permittee must not place incompatible wastes or incompatible wastes and materials in the same hazardous waste facility. The purpose of this is to prevent fires, explosions, gaseous emissions, leaching, or other discharges which could result.

It is possible for potentially incompatible wastes to be mixed in a way that precludes a reaction (e.g., adding acid to water rather than water to acid) or that neutralizes them (e.g., a strong acid mixed with a strong base), or by generating flammable gases in a closed tank equipped so that ignition cannot occur, and burning the gases in an incinerator. If an applicant plans to use any of these or other techniques, they should be fully described.

The following lists are examples of potentially incompatible wastes, waste components, and materials, along with the harmful consequences that result from mixing materials in one group with materials in another group. The list is intended to indicate the need for special precautions when managing these potentially incompatible waste materials or components. This list is not intended to be exhaustive. A permittee must, as the regulations require, adequately analyze his wastes so that he can avoid creating uncontrolled substances or reactions of the type listed below, whether they are listed below or not. In the lists below, the mixing of a Group A material with a Group B material may have the potential consequences as noted.

Group 1-A

Acetylene sludge
Alkaline caustic liquids
Alkaline cleaner
Alkaline corrosive liquids
Alkaline corrosive battery fluid
Caustic wastewater
Lime sludge and other corrosive alkaklies
Lime wastewater
Lime and water
Spent caustic

Group 1-B

Acid sludge
Acid and water
Battery acid
Chemical cleaners
Electrolyte acid
Etching acid(liquid or solvent)
Pickling liquor and other corrosive acids
Spent acid
Spent mixed acid
Spent sulfuric acid

Potential Consequences: Heat generation; violent reaction

Group 2-A

Aluminum
Beryllium
Calcium
Lithium
Magnesium
Potassium
Sodium
Zinc powder
Other reactive metals and metal hydrides

Group 2-B

Any waste in Group 1-A or 1-B

Potential Consequences: Fire or explosion; generation of flammable hydrogen gas.

- -

Group 3-A

Alcohols
Water

Group 3-B

Any concentrated waste in Groups 1-A or 1-B
Calcium
Lithium
Metal hydrides
Potassium
So_2Cl_2, $SOCl_2$, PCl_3, CH_3SiCl_3
Other water-reactive waste

Potential Consequences: Fire, explosion, or heat generation; generation of flammable toxic gases.

- -

Group 4-A

Alcohols
Aldehydes
Halogenated hydrocarbons
Nitrated hydrocarbons
Unsaturated hydrocarbons
Other reactive organic compounds and solvents

Group 4-B

Concentrated Group 1-A or 1-B wastes
Group 2-A wastes

Potential Consequences: Fire, explosion, or violent reaction.

- -

Group 5-A

Spent cyanide and sulfide solutions

Group 5-B

Group 1-B wastes

Potential Consequences: Generation of toxic hydrogen cyanide or hydrogen sulfide gas.

Group 6-A

Chlorates
Chlorine
Chorites
Chromic acid
Hypochlorites
Nitrates
Nitric acid, fuming
Perchlorates
Permanganates
Peroxides
Other strong oxidizers

Group 6-B

Acetic acid and other organic acids
Concentrated mineral acids
Group 2-A wastes
Group 4-A wastes
Other flammable and combustible wastes

Potential Consequences: Fire, explosion, or violent reaction.

5.8.3 Guidance to Address the Application Information Requirement --

A suggested attachment to the permit application is Management Plan for Incompatible Wastes. The applicant should first determine whether incompatible wastes and/or materials will be placed in surface impoundments by following the subsequent steps and providing the information in the permit application:

- Review the lists of incompatible wastes above and identify any that may be received.
- Identify other wastes to be disposed that are not shown in the above lists.
- Determine if any mixture of these wastes or materials is incompatible and identify the wastes and nature of the incompatibility. (Note: if available, the applicant may use Reference 10, A Method for Determining Compatibility of Waste, as an aid in determining compatibility of wastes; however, this document should be used with the cautions noted in Section 3.4.3.2 of this Manual.)

If incompatible wastes and/or materials will be stored or disposed together, the applicant must describe:

- Methods for identifying these wastes as they are received at the site.

- Step-by-step procedures for managing incompatible wastes or material to prevent undesirable reactions or effects defined in §264.17(b).

- Laboratory or field data demonstrating that incompatible wastes can be safely managed at the impoundment using the proposed procedures.

5.9 REFERENCES

1. U.S. Environmental Protection Agency. Permit Applicants' Guidance Manual for General Facility Standards. Washington, D.C., 1984 (being drafted).

2. U.S. Environmental Protection Agency. Test Methods for the Evaluation of Solid Waste. Physical/Chemical Properties. SW-846. Washington, D.C., 1982. GPO Stock No. 055-002-8100-2.

3. U.S. Environmental Protection Agency. Draft RCRA Guidance Document, Surface Impoundments: Liner Systems, Final Cover, and Freeboard Control. Washington, D.C., July 1982.

4. U.S. Environmental Protection Agency. Lining of Waste Impoundments and Disposal Facilities. SW-870, Washington, D.C., 1980. GPO Stock No. 055-000-00231-2.

5. U.S. Environmental Protection Agency. Draft RCRA Guidance Document, Landfill Design: Liner Systems and Final Cover. Washington, D.C., July 1982.

6. U.S. Environmental Protection Agency. Technical Resource Document. Closure of Hazardous Waste Surface Impoundments. SW-873. Washington, D.C., 1982. GPO Stock No. 055-000-00227-4.

7. U.S. Environmental Protection Agency. Technical Resource Document. Guide to the Disposal of Chemically Stabilized and Solidified Wastes. WS-872. Washington, D.C., 1982. GPO Stock No. 005-000-00226-6.

8. U.S. Environmental Protection Agency. Draft Solid Waste Leaching Procedure Manual. Washington, D.C. 1983.

9. U.S. Environmental Protection Agency. User Guide for the Hydrologic Evaluation of Landfill Performance (HELP) Model. Washington, D.C. (to be released in 1984).

10. Hatayama, H.K. et al. A Method for Determining the Compatibility of Hazardous Wastes. EPA-600/2-80-076. U.S. Environmental Protection Agency, Washington, D.C., April 1980. NTIS No. PB80-221005.

11. U.S. Environmental Protection Agency. Draft Technical Resource Document. Solid Waste Leaching Procedure. SW-924. Washington, D.C., 1984.

5.10 CHECKLIST

Table 5-2 is a checklist of permit application requirements for surface impoundments. Both storage and disposal impoundments are included. These two types are further subdivided to identify new versus existing units and the varying requirements, depending on liner configuration.

The applicant is encouraged to use the checklist and to incorporate it into the permit application. The checklist identifies the application requirements and provides references to Parts 264 and 270. The applicant should identify the location in the application of the material addressing each requirement. Space is provided for this. This will ensure that the application is complete. As noted in Section 4.0, it is suggested that a copy of this checklist be included as part of the permit application to aid the reviewers. This will help them to more readily locate specific aspects of the application and communications between reviewers and applicants will be facilitated.

Definitions of terms used in the checklist are provided below. Footnotes included in the checklist are explained on the last page of the checklist.

Storage SI: Storage Surface Impoundment

Existing:	A surface impoundment that was in operation or for which construction had commenced on or before issuance of Part B permit and which has or will receive hazardous wastes after January 26, 1983.

New, Type 1: Single liner (synthetic or soil). Ground-water monitoring required (g-w).

New, Type 2: Double liner, leak detection system, and above ground water. Ground-water monitoring not required.

New, Type 3: Exempt from liner requirement. Ground-water monitoring may not be required.

Disposal SI: Disposal Surface Impoundment

Existing: A surface impoundment that was in operation or for which construction had commenced on or before issuance of Part B permit and which has or will receive hazardous wastes after January 26, 1983.

New, Type 1: Single synthetic liner, ground-water monitoring required (g-w).

New, Type 2: Double liner, leak detection system, and above ground water. Ground-water monitoring not required.

New, Type 3: Exempt from liner requirement. Ground-water monitoring may not be required.

An "X" in the checklist indicates that the applicant for that type of unit must address the specific item or an equivalent optional item (if available) in the permit application.

An "O" in the checklist indicates that the item is optional in the permit application. Response to an optional item may eliminate the necessity of responding to certain items that might otherwise be required.

An "e" in the checklist indicates that the item does not apply to "existing portions" of existing units, but does apply to new portions of existing units.

A blank space in the checklist means that either the subject requirement is general, with specific requirements listed below it - the general subject requirement serves as a heading for subordinates, or that the subject requirement does not apply to that type of management unit.

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TABLE 5-2
PERMIT APPLICATION CHECKLIST FOR SURFACE IMPOUNDMENTS

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
270.14(b)		Part B General Information Requirements										
270.14(b)(1)		- General description of the facility	X	X	X	X	X	X	X	X		
270.14(b)(2)	264.13(a)	- Chemical and physical analysis of hazardous wastes to be handled	X	X	X	X	X	X	X	X		
270.14(b)(3)		- Waste analysis plan										
	264.13(b)(1) through (5)	- Analysis parameters with rationale	X	X	X	X	X	X	X	X		
		- Test methods for analyzing parameters	X	X	X	X	X	X	X	X		
		- Procedure for collecting representative samples	X	X	X	X	X	X	X	X		
		- Frequency of analyses	X	X	X	X	X	X	X	X		
		- List and description of waste analyses to be generator supplied	X	X	X	X	X	X	X	X		
	264.13(b)(6) and 264.17(c)	- Waste analysis procedures for ignitable, reactive, incompatible wastes	X	X	X	X	X	X	X	X		
	264.13(c)	- For off-site facilities, procedures to identify each waste movement, and	X	X	X	X	X	X	X	X		
		- Procedures for collecting representative samples	X	X	X	X	X	X	X	X		
270.14(b)(4)		- Security description for active portion of facility										

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
	264.14(a)	- Security procedures waiver justification	O	O	O	O	O	O	O	O		
		- Unknowing/unauthorized contact with waste not harmful	O	O	O	O	O	O	O	O		
		- Unknowing/unauthorized disturbance of waste or equipment cannot cause violation of Part 264	O	O	O	O	O	O	O	O		
	264.14(b)	- Description of 24-hour surveillance system, or	X	X	X	X	X	X	X	X		
		- Description of artificial or natural barriers, and	X	X	X	X	X	X	X	X		
		- Description of controlled entry/egress procedures, and	X	X	X	X	X	X	X	X		
	264.14(c)	- Description of warning signs	X	X	X	X	X	X	X	X		
		- List of languages on signs	X	X	X	X	X	X	X	X		
		- Statement of 25-foot legibility	X	X	X	X	X	X	X	X		
		- Description of sign locations and numbers of signs	X	X	X	X	X	X	X	X		
270.14(b)(5)		- General Inspection Schedule and Procedures Description	X	X	X	X	X	X	X	X		
	264.15(b)(1)	- Written schedule	X	X	X	X	X	X	X	X		

SURFACE IMPOUNDMENTS (Continued)

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Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
	264.15(b)(2) and 265.15(d)	- Statement as to where, at facility, inspection schedule and inspection records will be kept	X	X	X	X	X	X	X	X		
	264.15(b)(1)	- Identification of equipment/processes to be inspected	X	X	X	X	X	X	X	X		
	264.15(b)(3)	- Identification of types of problems each equipment/process to be checked for	X	X	X	X	X	X	X	X		
	264.15(b)(4)	- Frequency of inspections by equipment/process	X	X	X	X	X	X	X	X		
	264.15(c)	- Schedule of remedial action	X	X	X	X	X	X	X	X		
270.14(b)(5) and 270.17(d)	264.15(a) and 264.226	- Specific Inspection Requirements for Surface Impoundments, description of procedures for										
		- Inspection of liners/covers during and immediately after installation	e	X	X		e	X	X			
270.14(b)(5) and 270.17(d)	264.15(a) and 264.226	- Inspections weekly and after storms for	X	X	X	X	X	X	X	X		
		- Operation of overtopping controls	X	X	X	X	X	X	X	X		
		- Sudden drop in impoundment liquid level	X	X	X	X	X	X	X	X		
		- Presence of liquid in leak detection system			X				X			
		- Integrity of dikes/containment devices	X	X	X	X	X	X	X	X		

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
		- For new units, statement[a] from qualified engineer that integrity of dikes will be certified upon construction.		X	X	X		X	X	X		
		- Qualified engineer's certification of dike integrity for	X				X					
		- Stress	X				X					
		- Piping/scouring	X				X					
270.14(b)(6)	Part 264 Subpart C	- Preparedness and Prevention Documentation										
		- Waiver(s) request and justification	0	0	0	0	0	0	0	0		
	264.32(a)	- Description of internal communications/alarm system(s)	X	X	X	X	X	X	X	X		
	264.34(a)	- Documentation of personnel access to internal communication/alarm system(s)	X	X	X	X	X	X	X	X		
	264.32(b)	- Description of external communications/alarm system(s)	X	X	X	X	X	X	X	X		
	264.34(b)	- Documentation of personnel access to external communications/alarm system(s)	X	X	X	X	X	X	X	X		
	264.32(c)	- Description of fire control/extinguishing, spill control, and decontamination equipment	X	X	X	X	X	X	X	X		

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
	264.32(d)	- Documentation of adequate water volume and pressure for above equipment	X	X	X	X	X	X	X	X		
	264.33	- Documentation of equipment testing/ maintenance schedule and procedures	X	X	X	X	X	X	X	X		
	264.35	- Documentation of adequate aisle space	X	X	X	X	X	X	X	X		
	264.37 (also 264.52(c))	- Documentation and descriptions of arrangements or attempts at arrangements with:										
		- Police department(s)	X	X	X	X	X	X	X	X		
		- Fire department(s)	X	X	X	X	X	X	X	X		
		- Hospitals	X	X	X	X	X	X	X	X		
		- Local emergency response teams	X	X	X	X	X	X	X	X		
		- State emergency response teams	X	X	X	X	X	X	X	X		
		- Emergency response contractors	X	X	X	X	X	X	X	X		
		- Equipment suppliers	X	X	X	X	X	X	X	X		
	264.37(a)(2)	- Documentation of agreements designating primary emergency authority	X	X	X	X	X	X	X	X		
270.14(b)(7)	Part 264 Subpart D	- Contingency Plan Documentation										

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI				DISPOSAL SI				Location in Application	Comments
			Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners		
	264.51 and 264.52(a)	- Criteria for implementation of contingency plan	X	X	X	X	X	X	X	X		
	264.52(d)	- Emergency Coordinators Identification										
		- Names	X	X	X	X	X	X	X	X		
		- Addresses	X	X	X	X	X	X	X	X		
		- Home/Work Phones	X	X	X	X	X	X	X	X		
	264.55	- Documentation of Qualifications	X	X	X	X	X	X	X	X		
		- Documentation of Authority	X	X	X	X	X	X	X	X		
		- Description of notification procedure	X	X	X	X	X	X	X	X		
	264.52(e)	- Emergency equipment list										
		- Documentation of equipment location	X	X	X	X	X	X	X	X		
		- Physical description of equipment	X	X	X	X	X	X	X	X		
		- Statement of equipment capabilities	X	X	X	X	X	X	X	X		
	264.52(f)	- Evacuation Plan										
		- Criteria for implementation	X	X	X	X	X	X	X	X		
		- Description of signal(s) to implement	X	X	X	X	X	X	X	X		

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
		- Description of primary and allegnate routes	X	X	X	X	X	X	X	X		
	264.53	- Contingency Plan Copy Location										
		- Description of location of facility's copy of plan	X	X	X	X	X	X	X	X		
		- Number of duplicate copies distributed and their location	X	X	X	X	X	X	X	X		
	264.54	- Contingency Plan Amendment										
		- Identification of person responsible and authorized to change/amend plan	X	X	X	X	X	X	X	X		
		- Description of procedure to change/amend facility copy of plan	X	X	X	X	X	X	X	X		
		- Description of procedure to insure update of all copies of plan	X	X	X	X	X	X	X	X		
	264.56	- Detailed Emergency Procedures										
		- Procedure for facility personnel notification	X	X	X	X	X	X	X	X		
		- Procedure for state/local agency notification	X	X	X	X	X	X	X	X		
		- Procedure for identification of character, source, amount, and areal extent of released materials	X	X	X	X	X	X	X	X		

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
		- Procedure for assessment of environment/ human health hazards	X	X	X	X	X	X	X	X		
		- Identification of On-Scene Coordinator for geographic area	X	X	X	X	X	X	X	X		
		- Description of specific responses and control procedures for										
		- Fire	X	X	X	X	X	X	X	X		
		- Explosion	X	X	X	X	X	X	X	X		
		- Spill	X	X	X	X	X	X	X	X		
		- Description of process shutdown and monitoring procedures	X	X	X	X	X	X	X	X		
		- Description of cleanup procedures and associated material treating, storing, disposal procedures	X	X	X	X	X	X	X	X		
		- Description of emergency equipment cleaning and refitting procedures	X	X	X	X	X	X	X	X		
		- Description of procedures to insure incompatible waste segregation during cleanup	X	X	X	X	X	X	X	X		
270.14(b)(7) and 270.17(f)	264.227	- Specific Contingency Plan Requirements for Surface Impoundments										

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI				DISPOSAL SI				Location in Application	Comments
			Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners		
		- Procedure for stopping waste addition to impoundment	X	X	X	X	X	X	X	X		
	264.227	- Procedure for containing leakage	X	X	X	X	X	X	X	X		
		- Procedure to prevent catastrophic failure	X	X	X	X	X	X	X	X		
		- Procedure for emptying impoundment	X	X	X	X	X	X	X	X		
		- Procedure for recertifying and reactivating impoundment	X	X	X	X	X	X	X	X		
		- Procedure for closing impoundment	X	X	X	X	X	X	X	X		
[Note:		There are no §270 requirements which parallel Part 264, Subpart E. However, the applicant should be familiar with the following sections of the regulations since the requirements in them will be enforceable under any permit received. Part 264, Subpart E, §264.70 through §264.77 Part 270.30, Subpart C The applicant should be prepared to respond to inquiries by the permit application reviewers regarding these requirements.]										
270.14(b)(8)		- Preventive Procedures, Structures, and Equipment Documentation, including description of equipment/procedures to										
		- Prevent hazards during unloading operations	X	X	X	X	X	X	X	X		
		- Prevent water supply contamination	X	X	X	X	X	X	X	X		

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SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI				DISPOSAL SI				Location in Application	Comments
			Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners		
		- Mitigate equipment failure and power outages	X	X	X	X	X	X	X	X		
		- Prevent undue personnel exposure to wastes	X	X	X	X	X	X	X	X		
270.14(b)(9)	264.17	- Prevention of Accidental Ignition or Reaction Documentation										
		- Description of separation and protection of ignitable, reactive, incompatible wastes	X	X	X	X	X	X	X	X		
		- Description of ignitable, reactive, incompatible wastes handling procedures	X	X	X	X	X	X	X	X		
		- Description of number, location, and type of warning/prohibition signs	X	X	X	X	X	X	X	X		
		- Documentation that procedures are adequate to prevent accidental ignitions or reactions	X	X	X	X	X	X	X	X		
270.14(b)(9) and 270.17(h) and 270.17(i)	264.17(b)	- Specific Ignitable/Reactive Waste Requirements for Surface Impoundments if I/R wastes stored/disposed.										
	264.229	- Procedures that render waste nonreactive or nonignitable, or	X	X	X	X	X	X	X	X		
		- Procedures for preventing reactions, and	0	0	0	0	0	0	0	0		
		- Procedures for protecting wastes, or	0	0	0	0	0	0	0	0		
		- "Emergency use only" documentation	0	0	0	0						

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
	264.230	- Incompatible waste segregation or protection procedures	X	X	X	X	X	X	X	X		
270.14(b)(10)		- Traffic Documentation, identification of:										
		- Waste movement routes	X	X	X	X	X	X	X	X		
		- Number of movements by type vehicle	X	X	X	X	X	X	X	X		
		- Quantity of waste moved per movement per vehicle	X	X	X	X	X	X	X	X		
		- Traffic control signals and personnel	X	X	X	X	X	X	X	X		
		- Route surface composition and load bearing capacity	X	X	X	X	X	X	X	X		
270.14(b)(11)		- Facility Location Documentation										
270.14(b)(11)(i) and (ii)		- Political jurisdiction identified (new facilities only)		X	X	X		X	X	X		
		- Comparison to Appendix VI of Part 264	X	X	X	X	X	X	X	X		
		- Demonstration that faults with displacement in Holocene time are more than 3,000 feet from facility (western states)	X	X	X	X	X	X	X	X		
	264.18(a)	- If Holocene-time faults are within 3,000 feet, demonstration that no faults pass within 200 feet of unit sites (western states)	X	X	X	X	X	X	X	X		

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
270.14(b)(11), (iii) through (v)	264.18(b)	- Documentation of facility location relative to 100-year flood plain level or wave action flooding	X	X	X	X	X	X	X	X		
		- If unit in flood plain, documentation that facility can withstand the 100-year flood without washout by:	X	X	X	X	X	X	X	X		
		- Analysis of hydrodynamic/hydrostatic forces resulting at site from 100-year flood, and	X	X	X	X	X	X	X	X		
		- Presentation of operating units and flood protection devices design and how they will prevent washout, or	X	X	X	X	X	X	X	X		
		- Plan for removal of waste before washout including,	0	0	0	0	0	0	0	0		
		- Timing of removal relative to flood levels	0	0	0	0	0	0	0	0		
		- Estimated time to remove all waste	0	0	0	0	0	0	0	0		
		- Location to which waste will be moved and proof of compliance with Parts 270 and 264 through 267 of this Chapter	0	0	0	0	0	0	0	0		
		- Detailed description of personnel, equipment, and procedures for waste removal sufficient to insure availability in time for use	0	0	0	0	0	0	0	0		

SURFACE IMPOUNDMENTS (Continued)

			STORAGE SI				DISPOSAL SI					
Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Analysis of potential for discharge during waste movement	O	O	O	O	O	O	O	O		
		- A plan documenting how and on what time schedule the facility will comply with §264.18(b) if not in compliance (existing facilities only)	X				X					
270.14(b)(12)	264.16	- Personnel Training Program Documentation										
		- Outline of introductory and continuing personnel training programs	X	X	X	X	X	X	X	X		
		- Identification and qualifications of program instructor	X	X	X	X	X	X	X	X		
		- Brief description of how training program meets actual job tasks	X	X	X	X	X	X	X	X		
		- Description of procedures to insure all appropriate personnel receive appropriate training and receive annual training review	X	X	X	X	X	X	X	X		
		- Description of records to be kept, their location, and procedures to insure they are retained for proper length of time	X	X	X	X	X	X	X	X		
270.14(b)(13)	264.112	- Closure Plan Documentation										
		- Description of partial and final closure procedures	X	X	X	X	X	X	X	X		

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI				DISPOSAL SI				Location in Application	Comments
			Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners		
		- Description of maximum unclosed portion during facility life	X	X	X	X	X	X	X	X		
		- Estimate of maximum waste inventory in storage/treatment during facility life	X	X	X	X	X	X	X	X		
	264.114	- Equipment decontamination procedure	X	X	X	X	X	X	X	X		
		- Estimated year of closure	X	X	X	X	X	X	X	X		
	254.113	- Description of closure schedule including	X	X	X	X	X	X	X	X		
		- Total time to close	X	X	X	X	X	X	X	X		
270.14(b)(13)	254.113	- Trackable intervening closure activities	X	X	X	X	X	X	X	X		
		- Location(s) and number of copies of closure plan	X	X	X	X	X	X	X	X		
		- Identification of person responsible for storage and updating of facility copy of closure plan	X	X	X	X	X	X	X	X		
		- Procedure for updating all other copies of closure plan	X	X	X	X	X	X	X	X		
270.14(b)(13) and 270.17(g)	264.112 and 264.228(a)	- Specific Closure Plan Requirements for Surface Impoundments										
		- Procedures for removal and/or decontamination of all wastes and materials/equipment associated with the impoundment, or	X	X	X	X						

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
		- Detailing plans and engineering reports describing					X	X	X	X		
		- Elimination of free liquids					X	X	X	X		
		- Stabilization of remaining wastes					X	X	X	X		
		- Design of final cover demonstrating[1]	X				X	X	X	X		
		- Liquid migration minimization	X				X	X	X	X		
		- Function with minimum maintenance	X				X	X	X	X		
		- Drainage promotion	X				X	X	X	X		
		- Erosion/abrasion minimization	X				X	X	X	X		
		- Settling/subsidence accommodation	X				X	X	X	X		
		- Permeability less than liner or subsoils	X				X	X	X	X		
270.14(b)(13)	264.117 and 264.118	- Post-Closure Plan Documentation										
		- Description of ground-water monitoring activities and frequencies	X				X	X				
		- Description of maintenance activities and frequencies for:	X				X	X	X	X		
		- Final containment structures	X				X	X	X	X		

SURFACE IMPOUNDMENTS (Continued)

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Part 270	Part 264	Subject Requirement	STORAGE SI				DISPOSAL SI				Location in Application	Comments
			Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners		
		- Facility monitoring equipment *	X				X	X	X	X		
		- Location(s) and number of copies of post-closure plan	X				X	X	X	X		
		- Identification and location (address and phone number) of person responsible for storage and updating of facility copy of post-closure plan prior to closure	X				X	X	X	X		
		- Identification and location (address and phone number) of person responsible for storage and updating facility copy of post-closure plan during post-closure period	X				X	X	X	X		
		- Procedure for updating all other copies of post-closure period	X				X	X	X	X		
270.14(b)(13) and 270.17(g)	264.118 and 264.228(b)	- Specific Post-Closure Plan Requirements[1] for Surface Impoundments										
		- Procedures for maintenance and repair of final cover	X				X	X	X	X		
		- Procedures for maintenance and monitoring of leak detection system							X			
		- Procedures for maintenance and monitoring of ground-water monitoring system	X				X	X				
		- Procedures for compliance with Subpart F	X				X	X	X			

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI				DISPOSAL SI				Location in Application	Comments
			Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners		
		- Procedures for preventing run-on/run-off final cover damage	X				X	X	X	X		
270.14(b)(14)	264.120	- Documentation of Notice on Deed (existing facilities only)	X				X					
		- Statement that land used to manage wastes	X				X					
		- Statement of restricted use per §284.117(c)	X				X					
270.14(b)(15)	264.142	- Closure Cost Estimate	X	X	X	X	X	X	X	X		
	264.143 and 264.146	- Documentation of a financial assurance mechanism for closure that is one of the following:	X	X	X	X	X	X	X	X		
	264.151(a)	- Closure trust fund	0	0	0	0	0	0	0	0		
	264.151(b)	- Surety bond guaranteeing payment	0	0	0	0	0	0	0	0		
	264.151(c)	- Surety bond guaranteeing performance	0	0	0	0	0	0	0	0		
	264.151(d)	- Closure letter of credit	0	0	0	0	0	0	0	0		
	264.151(e)	- Closure insurance	0	0	0	0	0	0	0	0		
	264.15(f) and (h)	- Financial test and corporate guarantee	0	0	0	0	0	0	0	0		
		- Multiple financial mechanism for one facility	0	0	0	0	0	0	0	0		

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SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI				DISPOSAL SI				Location in Application	Comments
			Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners		
		- Single financial mechanism for multiple facilities	0	0	0	0	0	0	0	0		
270.14(b)(16)	264.144	- Post-Closure Cost Estimate[1]	X				X	X	X	X		
	264.145 and 264.146	- Documentation of a financial assurance mechanism for post-closure that is one of the following:	X				X	X	X	X		
	264.151(a)	- Closure trust fund	0				0	0	0	0		
	264.151(b)	- Surety bond guaranteeing payment	0				0	0	0	0		
	264.151(c)	- Surety bond guaranteeing performance	0				0	0	0	0		
	264.151(d)	- Post-closure letter of credit	0				0	0	0	0		
	264.151(e)	- Post-closure insurance	0				0	0	0	0		
	264.151(f) and (h)	- Financial test and corporate guarantee	0				0	0	0	0		
		- Multiple financial mechanism for one facility	0				0	0	0	0		
		- Single financial mechanism for multiple facilities	0				0	0	0	0		
270.14(b)(17)	264.147	- Documentation of Insurance	X	X	X	X	X	X	X	X		
		- Request for variance from insurance	0	0	0	0	0	0	0	0		
	264.151(i) and (j)	- Insurance for sudden/accidental occurrences	X	X	X	X	X	X	X	X		

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI				DISPOSAL SI				Location in Application	Comments
			Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners		
		- Insurance for nonsudden/accidental occurrences	X	X	X	X	X	X	X	X		
	264.151(g)	- Financial test for liability coverage	0	0	0	0	0	0	0	0		
270.14(b)(18)	264.149	- Documentation of a State Required Financial[2] Mechanism for Closure, Post-Closure, or Liability including	0	0	0	0	0	0	0	0		
		- EPA I.D. number	0	0	0	0	0	0	0	0		
		- Facility name	0	0	0	0	0	0	0	0		
		- Facility address	0	0	0	0	0	0	0	0		
		- Amounts of liability coverage or funds assured	0	0	0	0	0	0	0	0		
	264.150	- Documentation of State Assumed Responsibility[2] for Closure Post-Closure or Liability including	0	0	0	0	0	0	0	0		
		- Letter from State describing State's responsibilities	0	0	0	0	0	0	0	0		
		- Facility EPA I.D. number	0	0	0	0	0	0	0	0		
		- Facility name	0	0	0	0	0	0	0	0		
		- Facility address	0	0	0	0	0	0	0	0		
		- Amounts of liability coverage or funds assured	0	0	0	0	0	0	0	0		

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
270.14(b)(19)		- Topographic map showing a distance of 1,000 feet around facility at a scale of not more than 1 inch equals 200 feet that clearly shows	X	X	X	X	X	X	X	X		
		- Contours	X	X	X	X	X	X	X	X		
		- Proper contour intervals	X	X	X	X	X	X	X	X		
		- Map scale and date	X	X	X	X	X	X	X	X		
		- 100-year flood plain area	X	X	X	X	X	X	X	X		
		- Surface waters and intermittent streams	X	X	X	X	X	X	X	X		
		- Surrounding land uses	X	X	X	X	X	X	X	X		
270.14(b)(19)		- Wind rose	X	X	X	X	X	X	X	X		
		- North orientation	X	X	X	X	X	X	X	X		
		- Legal boundaries of facility site	X	X	X	X	X	X	X	X		
		- Access control	X	X	X	X	X	X	X	X		
		- Injection and withdrawal wells onsite and offsite	X	X	X	X	X	X	X	X		
		- Buildings and recreation areas	X	X	X	X	X	X	X	X		
		- Run-off control systems	X	X	X	X	X	X	X	X		

SURFACE IMPOUNDMENTS (Continued)

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Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
270.14(b)(19)		- Topographic map showing a distance of 1,000 feet around facility at a scale of not more than 1 inch equals 200 feet that clearly shows	X	X	X	X	X	X	X	X		
		- Contours	X	X	X	X	X	X	X	X		
		- Proper contour intervals	X	X	X	X	X	X	X	X		
		- Map scale and date	X	X	X	X	X	X	X	X		
		- 100-year flood plain area	X	X	X	X	X	X	X	X		
		face waters ?										

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI				DISPOSAL SI				Location in Application	Comments
			Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners		
		- Access and internal roads	X	X	X	X	X	X	X	X		
		- Storm, sanitary, and process sewerage systems	X	X	X	X	X	X	X	X		
		- Loading and unloading areas	X	X	X	X	X	X	X	X		
		- Fire control facilities	X	X	X	X	X	X	X	X		
		- Barriers for drainage or flood control	X	X	X	X	X	X	X	X		
		- Location of past or present operational units and equipment cleanup areas	X	X	X	X	X	X	X	X		
270.17, 270.18, 270.20 and 270.21		Part B Specific Information Requirements										
270.17		- Specific requirements for Surface Impoundments										
270.17(a)		- List of hazardous wastes placed or to be placed in impoundment	X	X	X	X	X	X	X	X		
270.17(b)	264.221	- Detailed plans and an engineering report describing										
270.17(b)(1)	264.221(a)	- Liner system construction (new only)	e	X	X		e	X	X			
	264.221(a)(1)	- Material of construction	e	X	X		e	X	X			
		- Chemical properties	e	X	X		e	X	X			
		- Physical strength	e	X	X		e	X	X			

SURFACE IMPOUNDMENTS (Continued)

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Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
		- Thickness	e	X	X		e	X	X			
	264.221(a)(2)	- Foundation design/integrity	e	X	X		e	X	X			
	264.221(a)(3)	- Area covered	e	X	X		e	X	X			
	264.221(a)(1)	- Liner system integrity against (new only)	e	X	X		e	X	X			
		- Internal and external pressure gradients	e	X	X		e	X	X			
		- Contact with waste/leachate	e	X	X		e	X	X			
		- Climatic conditions	e	X	X		e	X	X			
		- Installation stresses	e	X	X		e	X	X			
		- Daily operational stresses	e	X	X		e	X	X			
	264.221(b)	- Liner system exemption including				X				X		
		- Nature and quantity of wastes				X				X		
		- Alternative design and operation				X				X		
		- Impoundment location description				X				X		
		- Hydrogeologic setting				X				X		
		- Attenuative capacity of materials between impoundment and ground-water and surface water				X				X		

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
		- Documentation of no migration to ground/ surface waters at any future time				X				X		
270.17(b)(2)	264.221(c)	- Procedures/equipment to prevent overtopping from:	X	X	X	X	X	X	X	X		
		- Normal operation	X	X	X	X	X	X	X	X		
270.17(b)(2)	264.221(c)	- Abnormal operation	X	X	X	X	X	X	X	X		
		- Overfilling	X	X	X	X	X	X	X	X		
		- Wind/wave action	X	X	X	X	X	X	X	X		
		- Rainfall	X	X	X	X	X	X	X	X		
		- Run-on	X	X	X	X	X	X	X	X		
		- Equipment malfunctions	X	X	X	X	X	X	X	X		
		- Human error	X	X	X	X	X	X	X	X		
270.17(b)(3)	264.221(d)	- Structural integrity of dikes	X	X	X	X	X	X	X	X		
270.17(c)	264.222(a)	- Documentation for Part 264, Subpart F exemption including										
		- Impoundment and liner location above seasonal highwater table			X				X			
		- Two liners meeting §264.221(a) requirements			X				X			

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI				DISPOSAL SI				Location in Application	Comments
			Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners		
		- Leak detection system between liners			X				X			
270.14(c)	Part 264 Subpart F	Part B Protection of Ground-Water Information[3] Requirements for Surface Impoundments, Waste Piles, Land Treatment Units, and Landfills										
270.14(c)(1)		- Interim status period ground-water monitoring data summary	X				X					
270.14(c)(2)		- Identification of uppermost and hydraulically interconnected aquifers under facility including	X	X		X	X	X		X		
		- Water flow rate and direction	X	X		X	X	X		X		
		- Bases for identification	X	X		X	X	X		X		
270.14(c)(3) and 270.14(b)(19)		- Topographic map	X	X		X	X	X		X		
		- Delineation of property boundary	X	X		X	X	X		X		
	264.95(b)	- Delineation of waste management area	X	X		X	X	X		X		
	264.95(a)	- Delineation of proposed point of compliance	X	X		X	X	X		X		
		- Ground-water monitoring well locations	X	X		X	X	X		X		
		- Location of aquifers	X	X		X	X	X		X		
270.14(c)(4)(i) through (ii)		- Descriptions of existing contamination	X				X					
		- Delineation of plume extent	X				X					

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
		- Appendix VIII constituents concentrations	X				X					
		- Concentrations throughout plume	X				X					
		- Maximum concentration in plume	X				X					
270.14(c)(5)	264.97	- Detailed plans and an engineering report of Ground-Water Monitoring Program	X	X		X	X	X		X		
	264.97(a)	- Description of wells	X	X		X	X	X		X		
		- Number of wells	X	X		X	X	X		X		
		- Locations	X	X		X	X	X		X		
		- Depths	X	X		X	X	X		X		
		- Assurance of unaffected background water measurement	X	X		X	X	X		X		
		- Assurance of compliance point ground-water measurement	X	X		X	X	X		X		
	264.97(c)	- Casing description	X	X		X	X	X		X		
	264.97(d)	- Description of sampling/analysis procedures	X	X		X	X	X		X		
		- Sample collection methods	X	X		X	X	X		X		
		- Sample preservation/shipment	X	X		X	X	X		X		

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
		- Analytical procedures	X	X		X	X	X		X		
		- Chain of custody control	X	X		X	X	X		X		
	264.97(e)	- Documentation of proper/adequate analytical procedures	X	X		X	X	X		X		
	264.97(f)	- Procedure for determination of ground-water elevation with each sample	X	X		X	X	X		X		
270.14(c)(6)	264.91(a)(4) and 264.98	- Description of Detection Monitoring Program[4] including										
270.14(c)(6)(i)	264.93 and 264.98(a)	- List of indicator parameters, waste constituents, reaction products to be monitored for, including	X	X		X	X	X		X		
		- Type, quantities, concentrations expected in wastes	X	X		X	X	X		X		
		- Mobility, stability, persistence in unsaturated zone	X	X		X	X	X		X		
		- Detectability in ground-water	X	X		X	X	X		X		
270.14(c)(6)(ii) and (iii)	264.98(a)(4) and 26498(c)(1)	- Background ground-water concentration[5] values and coefficients of variation established by one of the following :	X	X		X	X	X		X		
	264 98(c)(3)	- Use of an appropriate ground-water monitoring system, and	0	0		0	0	0		0		

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI				DISPOSAL SI				Location in Application	Comments
			Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners		
	264.97(g)(1)	- Quarterly sampling of upgradient wells for one year, or	0	0		0	0	0		0		
	264.97(g)(3)	- Quarterly sampling of other wells for one year, and	0	0		0	0	0		0		
	264.97(g)(4)	- Data from a minimum of one sample/well and minimum of four samples per quarter, or	0	0		0	0	0		0		
		- Presentation of procedures to calculate such values	0	0		0	0	0		0		
270.14(c)(6)(ii)	264.98(b)	- Description of an appropriate ground-water monitoring system to be installed at the compliance point	X	X		X	X	X		X		
270.14(c)(6)(iv)	264.98(d)	- Procedures for collecting semi-annual ground-water samples at the compliance point during	X	X		X	X	X		X		
		- Active life	X	X		X	X	X		X		
		- Closure period	X	X		X	X	X		X		
		- Post-closure period	X	X		X	X	X		X		
	264.98(e)	- Procedure for annual determination of uppermost aquifer flow rate and direction	X	X		X	X	X		X		

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
	264.98(f) and 264.97(d) and (e)	- Documentation of sample collection and analysis procedures	X	X		X	X	X		X		
	264.98(g)	- Procedure for determining a statistically significant increase for any monitored parameter or constituent by	X	X		X	X	X		X		
		- Comparing compliance point data to background value data using the procedures in §264.97(h)(1) or (2), and	X	X		X	X	X		X		
		- Providing an estimate of the time period after sampling completion necessary to obtain results	X	X		X	X	X		X		
	264.98(h)	- Procedure to be implemented if a statistically significant increase in any constituent or parameter is identified at any compliance point monitoring well, including	X	X		X	X	X		X		
	264.98(h)(1)	- Written notification to Regional Administrator	X	X		X	X	X		X		
	264.98(h)(2)	- Sample collection and analysis methods for all Appendix VIII constituents at all monitoring wells	X	X		X	X	X		X		
	264.98(h)(3)	- Method for establishing Appendix VIII constituent background values	X	X		X	X	X		X		

SURFACE IMPOUNDMENTS (Continued)

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Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
	264.98(h)(4)	- Preparation of an application for permit modification to establish compliance monitoring	x	x		x	x	x		x		
270.14(c)(7)	264.91(a)(1) and 264.99	- Description of Compliance Monitoring Program[6], including	0	0		0	0	0		0		
		- List of wastes previously handled at facility	0				0					
		- Characterization of contaminated ground-water[7]	0				0					
		- Hazardous constituents identified	0				0					
		- Hazardous constituents concentrations	0				0					
	264.99(b)	- Description of compliance monitoring system at the compliance point	0	0		0	0	0		0		
		- List of hazardous constituents to be compliance monitored	0	0		0	0	0		0		
	264.96	- Proposed compliance period	0				0					
	264.99(d)	- Procedure for collecting quarterly samples at compliance point during compliance period	0	0		0	0	0		0		
	264.99(c)(3)	- Procedures for establishing background concentration values for constituents that are based on one of the following:	0	0		0	0	0		0		
		- Use of an appropriate ground-water monitoring system, and	0	0		0	0	0		0		

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI: Existing	STORAGE SI: New, Type 1, 1 liner, g-w	STORAGE SI: New, Type 2, 2 liners	STORAGE SI: New, Type 3, 0 liners	DISPOSAL SI: Existing	DISPOSAL SI: New, Type 1, 1 liner, g-w	DISPOSAL SI: New, Type 2, 2 liners	DISPOSAL SI: New, Type 3, 0 liners	Location in Application	Comments
	264.97(g)	- Data that is available prior to permit issuance	0	0		0	0	0		0		
		- Data that accounts for measurement errors in sampling and analysis	0	0		0	0	0		0		
		- Data that accounts for seasonal ground-water quality fluctuations	0	0		0	0	0		0		
		- Data from a minimum of one sample per well and a minimum of four samples from monitoring system, each time system is sampled	0	0		0	0	0		0		
270.14(c)(7)(iv)	264.92 and 264.99(c)(1), (2)	- Proposed concentration limits for constituents with justification based on	0	0		0	0	0		0		
		- §264.94(a)(1) and §264.97(g)	0	0		0	0	0		0		
		- §264.94(a)(2)	0	0		0	0	0		0		
		- §264.94(b) and §264.99(c)(1)	0	0		0	0	0		0		
	264.99(e)	- Procedure for annual determination of uppermost aquifer flow rate and direction	0	0		0	0	0		0		
	264.99(f)	- Procedures for annual testing of all compliance point wells for Appendix VIII constituents	0	0		0	0	0		0		
	264.99(g)	- Documentation of all sampling and analysis procedures	0	0		0	0	0		0		

SURFACE IMPOUNDMENTS (Continued)

Part 270	Part 264	Subject Requirement	STORAGE SI				DISPOSAL SI				Location in Application	Comments
			Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners		
	264.99(h)	- Procedures for determining a statistically significant increase for any monitored constituent by	0	0		0	0	0		0		
		- Comparing compliance point data to the concentration limit using the procedure in §264.97(h)(2)	0	0		0	0	0		0		
		- Providing an estimate of the time period after sampling completion necessary to obtain results	0	0		0	0	0		0		
	264.99(i)	- Procedures to be implemented if the ground-water protection standard is exceeded at any compliance point monitoring well, including	0	0		0	0	0		0		
	264.99(i)(1)	- Written notification to Regional Administrator	0	0		0	0	0		0		
	264.99(i)(2)	- Preparation of an application for permit modification to establish a corrective action program, including	0	0		0	0	0		0		
		- Details of program to comply with ground-water protection standard	0	0		0	0	0		0		
270.14(c)(7)(v)	264.99(i)(2)(ii)	- Details of ground-water monitoring to demonstrate effectiveness of program	0	0		0	0	0		0		
270.14(c)(8)	264.91(a)(2) and 264.100	- Description of Corrective Action Program[8], including	0	0		0	0	0		0		
270.14(c)(9)(i)		- Characterization of contaminated ground-water	0				0					

FOOTNOTES FOR SURFACE IMPOUNDMENTS

[1] Notwithstanding the fact that the applicant intends to remove all wastes at closure, an existing storage surface impoundment that does not have a liner meeting the Part 264 liner requirements and has not received a variance will be required to present plans to cover the impoundment at closure in the event that all hazardous material cannot be removed.

[2] State-specific. Contact State or Regional EPA representatives to discuss requirements.

[3] New, Type 3 units are not automatically exempt from ground-water protection standards of Subpart F. Applicants are subject to indicated requirements unless a §264.90(b)(4) waiver has been granted.

[4] Applies to new facilities and existing facilities at which contamination has not been detected.

[5] Existing facilities must submit interim status ground-water monitoring data including background data for certain parameters. If no data are available, contact appropriate State or Regional EPA personnel.

[6] Required of existing facilities where ground-water monitoring data indicates the presence of hazardous constituents. New or existing units without contamination may have a proposed Compliance Monitoring Program included in the permit on "stand by" under some circumstances.

[7] Applicable to existing facilities with indications of hazardous constituents in the ground water.

[8] Applicability to existing facilities will be case-by-case, based on monitoring data indicating ground-water contamination. New Type 1 and Type 3 units and existing units without contamination may have Corrective Action Plans in permit on "stand by" under some circumstances.

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SECTION 6.0

WASTE PILE PERMIT APPLICATION GUIDANCE

The regulations promulgated in Part 264 apply to waste piles used to treat and/or store hazardous waste. They apply to both new and existing waste management units and distinguish between these units in appropriate circumstances. Part 264, Subpart L contains the design and operating standards.

Waste piles may not be used to intentionally dispose of wastes. If the owner or operator of a pile wishes to dispose of wastes, he must apply for a landfill permit and manage the pile as a landfill.

The regulatory goal adopted in the design and operating standards is to minimize the formation and migration of leachate to the adjacent subsurface soil or ground water or surface water. To this end, unless exempted, units must have liners to prevent migration of wastes to the subsurface soil or to ground water and surface waters during the active life of the unit. Waste piles are also required to have leachate collection and removal systems. A variance from the liner and leachate collection requirements is available to units if applicants demonstrate that wastes will never migrate to ground water or surface water. In addition, existing portions of units are exempt from these requirements. This section is divided into ten subsections:

6.1 Waste Description

6.2 Design and Operating Requirements

6.3 Monitoring and Inspection

6.4 Exemption to Liner Standard and Ground-Water Protection Standard

6.5 Treatment of Waste

6.6 Special Requirements for Ignitable or Reactive Wastes

6.7 Special Requirements for Incompatible Wastes

6.8 Closure

6.9 References

6.10 Checklist

6.1 WASTE DESCRIPTION

6.1.1 The Federal Requirement

Section 270.18(a) requires that the Part B Application include:

> A list of hazardous waste placed or to be placed in each waste pile.

A related standard, Section 270.13(j), requires that the application include:

> A specification of the hazardous wastes listed or designated under 40 CFR Part 261 to be treated, stored, or disposed at the facility, an estimate of the quantity of such wastes to be treated, stored, or disposed annually, and a general description of the processes to be used for such wastes.

A second related standard, Section 270.14(b)(2), requires that the application include:

> Chemical and physical analyses of the hazardous wastes to be handled at the facility. At a minimum, these analyses shall contain all the information which must be known to treat, store, or dispose of the wastes properly in accordance with Part 264.

6.1.2 Guidance to Achieve the Part 264 Standard

Section 264.13(a) requires the applicant to gather the data that must be submitted to comply with the above application requirements. The Permit Applicants' Guidance Manual for General Facility Standards (Reference (1)) provides detailed guidance on waste analyses and waste analysis plans.

Under Section 270.18(a) the applicant is required to submit a list and physical description of the wastes that have been or will be placed in each waste pile. The source of the data gathered to comply with this requirement will vary from site to site. For example, the facility's records of analyses performed on the waste before the effective date of these regulations, or studies conducted on hazardous waste generated from processes similar to that which generated the waste to be managed at the facility, may assist in complying with this requirement.

Under Part 270.18(a) the applicant is required to submit a list and physical description of the wastes that have been or will be placed in each waste pile. The source of the data gathered to comply with this requirement will vary from site to site. For example, the facility's records of analyses performed on the waste before the effective date of these regulations, or studies conducted on hazardous waste generated from processes similar to that which generated the waste to be managed at the facility, may assist in complying with this requirement. The permittee of an off-site facility may obtain part or all of the information required standard from the generator. If the generator does not supply the information, and the permittee chooses to accept a hazardous waste, the permittee is responsible for obtaining the information required to comply with this section.

In addition, §264.13(b)(4) requires that additional waste analyses be conducted during the operating life of the facility with sufficient frequency to ensure that the analysis is accurate and up to date.

6.1.3 Guidance to Address the Application Information Requirement

The following information should be reported for each waste:

- Common name of waste
- EPA hazardous waste ID number
- Location(s) within the waste pile where the waste is or will be located
- Volume of waste received per month including actual or estimated averages, maximum or minimums
- Form of the waste when disposed (e.g., containerized, bulk solid, etc.)
- Approximate moisture content, texture, and other significant features
- Special handling requirements

For guidance in this matter the applicant is referred to Part 261, which includes regulations for identifying hazardous wastes. These regulations include definitions, criteria for identifying the characteristics of hazardous waste and for listing hazardous wastes, characteristics of hazardous waste, and lists of hazardous waste. In addition, appendices address representative sampling methods and EP toxicity procedures. The sampling and analytical methods applicable to identifying the constituents of hazardous wastes are also described in EPA publication SW-846, Test Methods for the Evaluation of Solid Waste, Physical/Chemical Parameters [Reference (2)]. A suggested attachment to the permit applications is the List of Hazardous Wastes.

6.2 DESIGN AND OPERATING REQUIREMENTS

This section provides guidance on the permit application information requirements related to the design and operating requirements in §264.251. Topics discussed include the following:

6.2.1 Liner Performance Standards

6.2.2 Leachate Collection and Removal System

6.2.3 Liner and Leachate Collection System Exemption

6.2.4 Control of Run-On

6.2.5 Control of Run-Off

6.2.6 Management of Units Associated with Run-On and Run-Off Control Systems

6.2.7 Control of Wind Dispersal

6.2.8 Ground-Water Protection Exemption for Double-Lined Piles

6.2.9 Ground-Water Protection Exemption for Piles with Inspectable Liners

6.2.1 Liner Performance Standards

6.2.1.1 The Federal Requirements--

Section 270.18(c) requires that the Part B application include:

> Detailed plans and an engineering report describing how the pile is or will be designed, constructed, operated and maintained to meet the requirements of §264.251. This submission must address the following items as specified in §264.251:
>
> (1) The liner system (except for an existing portion of a pile). If an exemption from the requirement for a liner is sought, as provided by §264.251(b), the owner or operator must submit detailed plans and engineering and hydrogeologic reports as appropriate, describing alternate design and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituents into the ground water or surface water at any future time;

(2) Control of run-on;

(3) Control of run-off;

(4) Management of collection and holding units associated with run-on and run-off control systems; and

(5) Control of wind dispersal of particulate matter, where applicable.

Facility Standard 264.251(a)(1) states:

(a) A waste pile (except for an existing portion of a waste pile) must have:

(1) A liner that is designed, constructed, and installed to prevent any migration of wastes out of the pile into the adjacent subsurface soil or ground water or surface water at any time during the active life (including the closure period) of the waste pile. The liner may be constructed of materials that may allow waste to migrate into the liner itself (but not into the adjacent subsurface soil or ground water or surface water) during the active life of the facility.

The liner must be: (1) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation.

(ii) Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift.

(iii) Installed to cover all surrounding earth likely to be in contact with the waste or leachate.

6.2.1.2 Guidance to Achieve the Part 264 Standard --

The basic performance goal for waste pile liner designs is that they prevent the release of hazardous constituents to ground and surface waters through closure. Subpart L of

Part 264 covers only waste piles from which all wastes, waste residues, containment system components (e.g., liners), and contaminated subsoils will be removed at closure. Waste piles from which these will not be removed at closure are regulated as landfills under Subpart N.

In accordance with §264.251(a), a waste pile liner system must be designed, constructed, and maintained to prevent, through scheduled closure, the migration of hazardous constituents from the pile to the surrounding environment. The liner may be constructed of materials that may allow waste or hazardous constituents to migrate into the liner, but must not allow migration through the liner into the adjacent subsurface soil or ground or surface water during the active life of the pile. In addition, EPA has recommended that liner systems be constructed wholly above the seasonal high water table, that is, in the unsaturated zone.

The design and operating standards contain an exemption for "existing portions." An existing portion is any area of a waste pile identified in a Part A permit application on which waste has been placed at the time of permit issuance. However, existing portions are subject to the remainder of the design and operating requirements, as well as the ground-water protection requirements. The exemption applies only to existing portions of existing units. New portions of existing units are not entitled to the exemption.

In developing this guidance, the Agency has attempted to come as close as possible to complete containment for the life of the waste piles. However, the Agency also considered that designs based on this guidance be based on conventional technology, utilize readily available equipment and materials, and be constructed at reasonable cost.

Essentially complete temporary containment is practical using synthetic liners. However, experience with synthetic liners in contact with chemicals is relatively recent. Predictions based on chemistry, and limited, recent field experience are sufficient to convince the Agency that, with proper selection for chemical resistance, design, installation, and operation, containment for at least 30 years is practical utilizing a single, synthetic liner. Therefore, a single, synthetic liner system may be appropriate for waste piles which will complete closure in less than 30 years.

Soil liners, in contrast to synthetic liners, may become saturated with leachate and eventually release hazardous constituents. However, predictions can be made on the flow time of leachate through soil liners. Therefore, if the soil used possesses appropriate properties, is properly placed, and is of sufficient thickness, soil liners can be expected to provide containment for the life of the waste pile. Thus, because Subpart L requires the removal of all wastes and liners (including soil liners), and any contaminated subsoils at closure, the intent is that no hazardous constituents should be released to ground water.

A third option for waste piles is a single base of admixed materials such as concrete or asphalt. Such bases must be thick enough to be structurally stable. A structurally stable base is one which is not prone to cracking or crumbling under the conditions to which it will be exposed. Appropriate base materials should be chosen in consideration of the specfic waste anticipated to be stored or treated in the pile and proposed operating techniques.

For waste piles which will not close within 30 years and which incorporate a synthetic membrane, the Agency suggests a double liner incorporating a top synthetic liner and a secondary soil (clay) liner. With the double liner system, if the primary synthetic liner deteriorates in the future, the secondary soil (clay) liner will minimize transmission of leachate. Natural materials such as clay are not prone to deterioration over time and should function indefinitely unless physically damaged or affected by chemical constituents. Liners of admixed materials such as concrete or asphalt may also be used for long-lived waste piles when an analysis of the chemistry and physics of the application indicates that the liner will not deteriorate and lose function during the pile life.

In addressing the requirements, the following key points should be kept in mind:

- Liner systems should be constructed wholly above the seasonal high water table, i.e., in the unsaturated soil or above grade;
- As a minimum, the liner system should consist of a single liner of soil (clay), synthetic material, or admixed material;

- Where a synthetic liner is used under any pile that will not complete closure for 30 or more years after the first placement of wastes, the liner system should consist of the primary synthetic liner and a secondary soil liner, such as clay.
- All waste piles must have a leachate collection and removal system installed above the primary liner (except for waste piles with exemption from the leachate collection and removal system requirement).

A wide range of materials are available for the construction of liners for hazardous waste piles, with the most common being clay soil and synthetic liners. The liner must be constructed of materials that will resist degradation. Synthetic liners can be degraded by exposure to incompatible wastes or leachate and in some cases by excessive exposure to sunlight. Clay liners can develop highly increased permeabilities (sometimes by several orders of magnitude) when exposed to certain types of chemicals.

Chemical testing of liners is prudent because liners can be degraded by certain wastes and waste constituents. Because wastes and the chemical characteristics of liners are almost infinitely variable, it is difficult to generalize concerning incompatibility. The Agency, therefore, prefers test data as the way to demonstrate the compatibility of waste and liner materials, but recognizes that historic data or theoretical chemistry may provide sufficient information in some cases. The EPA's Office of Research and Development in Cincinnati, Ohio is currently developing a summary of waste/liner compatibility information. Data currently available to EPA indicate that the following combinations of waste types and liner materials are often incompatible:

- Polyvinyl chloride (PVC) can be dissolved by chlorinated solvents;
- Chlorsulfonated polyethylene can be dissolved by aromatic hydrocarbons;
- Clays can exhibit permeability changes when exposed to selected concentrated organics;
- Asphaltic materials can dissolve in oily wastes;
- Concrete and lime based materials are dissolved by acids; and
- Clays can exhibit permeability changes increase or decrease when exposed to inorganics of high and low pH.

An acceptable test method for evaluating waste/liner compatibility is included in Appendix B of the Draft RCRA Guidance Document, Waste Piles - Liner Design (Reference 3). The test method exposes a liner sample to the waste or leachate encountered at the pile. After exposure, the liner sample is tested for important characteristics--saturated hydraulic conductivity in the case of soil liners; strength (tensile, tear, and puncture), weight loss, and hydraulic conductivity in the case of synthetics. The Agency considers any significant deterioration in any of the measured properties to be evidence of incompatibility unless a convincing demonstration can be made that the deterioration exhibited will not impair the integrity of the liner over the life of the pile. Even though test results may show the amount of deterioration to be relatively small, the Agency is concerned about the accumulative effects of exposure over time.

Synthetic liners should consist of at least a 0.76 mm (30 mil) membrane that is chemically resistant to the waste managed and the leachate generated. In judging chemical compatibility of wastes and liners, the Agency will consider appropriate historical data, demonstrations involving theoretical chemistry and actual test data. Testing of chemical resistance of liners should be performed using either the EPA test method or an equivalent test method.

Soil liners should have a hydraulic conductivity which will not increase beyond 1 x 10^{-7} cm/sec as a result of prolonged contact with the waste and leachate generated. Testing of the effect of leachate on soil liner hydraulic conductivity should be performed using either the EPA test method or an equivalent test method.

Liner materials must have sufficient strength and thickness to prevent failure due to physical stresses (e.g., earth-moving equipment, dredging equipment, and the weight of large volumes of liquid wastes). While this requirement applies to all liners, it is especially crucial for synthetic liners, which can rupture if they are mishandled or are too thin. Most synthetic liners should be at least 0.76 mm (30 mils) thick to assure this requirement is met.

The foundation beneath the liner must be capable of supporting the liner and waste material and resisting pressure gradients. If the support system settles, or suffers uplifts, the liner may rupture or crack. The existence of organics or soluble material in the foundation could result in the generation of gases and the creation of voids beneath the liner. Locations of waste piles should be selected to avoid these situations or foundation designs should account for them.

6.2.1.3 Guidance to Address the Application Information Requirements --

Liner selection and design is one of the most difficult aspects of waste pile design. The liner serves as the primary barrier to leachate migration. It must be chemically compatible with this leachate, and strong enough to resist tearing during installation and operation. The nature of the liner foundation is an integral part of liner design. To address the application information requirements for liner system design, the applicant is advised to submit information on the following three areas:

- Liner Specifications
- Foundation Analysis
- Liner Integrity Analysis

A suggested attachment to the permit application is Liner System Design. The attachment should contain detailed specifications, raw data, calculations, drawings, assumptions, and so on, supporting the proposed design. A discussion of the rationale supporting the overall design should be included in the basic portion of the application. The discussion should present the reasons why and how the design meets the specific requirements.

6.2.1.3.1 Liner Specifications -- The applicant should identify the materials of construction, and specifications of strength, thickness, and chemical properties of the proposed liner. The applicant should also submit design plans that show the method of liner placement. This should demonstrate that the liner will cover all areas of the unit that will be exposed to wastes and leachate.

The applicant is responsible for all aspects of the application including material specifications. The liner material specifications can be taken from specifications provided by the manufacturer as long as the applicant proposes these as the minimum acceptable specifications. The Liner Integrity Analysis section describes the nature of engineering reports to justify the selected liner strength, thickness, and chemical compatibility. Appendix VIII of Reference (5) can be used to obtain the minimum values of physical properties of a synthetic liner that are necessary to produce a quality liner material.

The liner design plans should be in standard construction drawing format. The plans should show the extent of areal coverage for each waste pile unit. The plan should also present cross-sectional views. Details of seaming methods, anchoring, and other special features should be provided in the plans and in narrative form. See Appendix D for liner guide specifications.

6.2.1.3.2 Foundation Analysis -- The soils beneath a liner support the liner, waste, and cover. If these soils settle, shear, or uplift, the liner may be damaged. Hydrostatic and gas pressure can also impact on liner performance. The potential for these situations to occur at a given location can be reliably assessed by a geotechnically qualified, registered engineer. In many cases, standard engineering practices can be implemented to alleviate a potential for liner deflection.

The foundation analysis should be a report, included in the Liner System Design attachment, that assesses the potential for liner deflection due to settlement, compression, shear, or uplift of the foundation soils, and due to hydraulic and gas pressures on the liner. The following items should be considered in this report:

- Geologic Data. A description should be provided of regional and site geology, including:
  - -- Geologic setting
  - -- Soil types and characteristics (including boring logs)
  - -- Bedrock types and depths (including boring logs)
  - -- Subsidence history
  - -- Sinkhole potential

  [Note that much of this information is also recommended in Section 9.0. of this manual.]

- Geotechical Data. A description should be provided of the engineering characteristics of the foundation soils. Data on soil index properties, shear strength, hydraulic conductivity, and compressibility should be provided.

- Hydrogeologic Data. A description should be provided of the characteristics of the saturated zone of the site, including its relationship to surface water. Section 9.0 can be used for further guidance on this topic.

- Seismic Setting. A description should be provided on the potential for ground shaking and surface response at the site. While the facility may not be in a jurisdiction in which the seismic location standard [§264.18(a)] is applicable, it is advisable to design a facility to withstand a design earthquake. Many regions of the country that have experienced earthquake activity should have information on their frequency and magnitude, and may even have established local standards for the design of structures. Generally, earth structures can be easily designed to withstand the vertical and horizontal accelerations experienced during such design earthquakes. Specific seismic design consideration should be given to structures used to shelter waste piles.

The report should summarize the foundation investigation and analysis. It should include all data collected during the investigation, all calculations performed during the analysis, and a description of the methods used in the investigation and analysis. Total and differential settlements that can occur during the active and closure period of the unit should be estimated, including immediate settlement, primary and secondary consolidation, creep, and liquefaction. Bearing capacity and stability of the foundation should be evaluated.

The subsurface investigation should thoroughly characterize the in situ properties of the subsurface materials. Subsurface exploration should consist of test borings and test pits, and may also include geophysical surveys.

Test borings should be performed to adequate depths and at a sufficient number of locations to define the subsurface conditions. The method of drilling should be based on a preliminary subsurface investigation. Test pits should be excavated to identify near-surface conditions. Geophysical surveys may be performed to more accurately identify bedrock depths and fractured zones. Other types of geotechnical tests (i.e., cone penetrometer, vane shear, standard penetration) may be performed, as required, for the specific conditions at the site. Many standard techniques for geotechnical investigations are available in Sampling of Soil and Rock, American Society for Testing and Materials (ASTM) Special Technical Publication 483, June 1970, and Subsurface Exploration and Sampling of Soils for Civil Engineering Purposes,

M. Juul Hvorslev, Army Corps of Engineers, Waterways Experiment Station, 1965. The subsurface investigation program can be combined with the investigations undertaken in response to the ground-water monitoring and aquifer identification requirements in 264 Subpart F.

Laboratory testing of subsurface materials should be conducted to determine index properties and engineering parameters. Index property testing should include:

- Grain size distribution curves
- Atterberg limits
- Specific gravity
- Moisture content and dry density

Shear strength of soils may be determined using direct shear, triaxial, or unconfined compression testing, as appropriate for the soil condition. The methods for saturated hydraulic conductivity determination described in Reference 4 (Method 9100) should be used; in most cases, hydraulic conductivity (often referred to as permeability) should be determined using field methods, rather than laboratory techniques. The compressibility characteristics should be determined by performing a sufficient number of consolidation tests.

6.2.1.3.3. Liner Integrity Analysis-- The integrity of a liner is a function of several factors. Incompatible chemicals can dissolve the liner. Excessive stress during either installation or operation can cause tears or broken seams. Climate can also adversely affect a liner. It is critical that a liner be carefully selected to be compatible with the wastes it must contain. The liner must also have adequate strength to resist tearing during installation. It must be protected from punctures by a bedding layer. Normally, the leachate collection system can be the protective layer for the top of the liner; a bedding layer beneath the liner is also needed. Seaming techniques are extremely important as well. Finally, the liner should have sufficient strength to resist failure from any anticipated or likely settlement or movement of the foundation.

The applicant should submit a detailed report that demonstrates the integrity of the liner against:

- Contact with waste/leachate (i.e., waste-liner compatibility
- Internal and external pressure gradients
- Climatic conditions
- Installation stresses
- Daily operational stresses

Waste-Liner Compatibility

The applicant should submit results of compatibility testing. These results should demonstrate the acceptability of the selected synthetic liner. The following information should be provided on the tests used to make the compatibility demonstrations:

- Name of the test method used.
- Procedure and details of the test method (e.g., number of test specimens, length of the test, and the nature of leachate used).

- Chemical and physical characteristics of the waste(s) tested, including the EPA hazardous waste number, physical class (e.g., aqueous-inorganic, aqueous-organic; organic, solid, sludge, etc.), and waste sources (including description of production and waste treatment processes from which the waste stream is generated).
- Raw test results.
- An explanation of how the raw test results were interpreted to lead to the selection of the synthetic liner proposed as the primary liner for the landfill.

An acceptable test method for examining compatibility of wastes/leachate and synthetic liners is the "Immersion Test of Membrane Liner Materials for Compatibility with Wastes," found as Method 9090 in Reference 2. An earlier form of this test was published as Appendix A in the July 1982 draft of the RCRA Technical Guidance Document entitled Landfill Design: Liner Systems and Final Cover (Reference 4).

Liner manufacturers commonly provide information on the compatibility of their liners with single chemical compounds. This information is generally in the form of qualitative rankings (e.g., resistant, poor), rather than in quantitative form. These types of data may be supportive, but will not be accepted as definitive proof of compatibility. In most actual situations, a liner will be exposed to a combination of waste types, rather than to a single chemical compound. Consequently, the manufacturers' tests do not adequately simulate field exposure conditions. Also, EPA is generally unaware of the numerical bases used by manufacturers in establishing their qualitative rankings. Therefore, EPA must examine the raw data from the exposure test.

Waste compatibility tests should be conducted using representative samples of the wastes and leachates to which the liner is, or will be, exposed. Several methods for obtaining samples of hazardous wastes are discussed in Section 1 of Test Methods for Evaluating Solid Waste (2). Reference (11) also provides information on collecting leachate samples. Selection of a method depends on the ambient physical state of the waste to be sampled (liquid, slurry, solid). If the waste is a liquid or has a free liquid component, this liquid is called the primary leachate and must be included in the sample. If the waste is a solid or slurry that does not have a free liquid component, then the procedures given below for extracting primary and secondary leachates should be employed.

The primary leachate is the liquid that can be extracted from the waste by vacuum filtration at 25° C and 15.3 kg/cm^2 (15 bars) of vacuum. It should be measured as a percentage of the total waste on a wet weight basis. If there is more than one distinct immiscible phase in the primary leachate, collect enough of each phase (approximately 5 liters) to perform the compatibility testing with each phase. The secondary leachate is a fluid extracted by vacuum filtration after mixing the waste thoroughly with just enough water to make a saturated paste (waste barely flows together into a hole in the paste made with a spatula.

The Agency encourages applicants to include the use of liner samples (coupons) in the liner system design. The coupons should be separate pieces of liner material at least one foot square and include one field seam. The coupons are placed in the leachate collection system sump and later retrieved and tested to assess the liner's integrity. Testing of the coupons can forewarn permittees of liner performance far enough in advance of failure that remedial action may be taken before failure results in catastrophic contamination, and immense corrective action costs. The Agency also hopes to obtain data from sites using coupons to further the knowledge of liner integrity. See Section 5.4.7 of Reference 5 for more details on the use of coupons.

As discussed above, the applicant should submit data on physical classification of the waste with the compatibility test description and results. The following is a brief description of the physical classes of waste. Aqueous-inorganic (AI) and aqueous-organic (AO) are classes of waste in which water is the solvent (predominant liquid), and the solutes are mostly other organic chemicals dissolved in the organic solvent. Solids, sludges, and slurries (S) are wastes high in solids such as tailings, settled matter, or filter cakes.

Climatic Conditions

During liner system design, the applicant should consider impacts of the local climate on the material(s) selected. Data supporting liner selection with regard to climate should be submitted in the application and include:

- Extremes of air temperatures at facility location.
- Depth of soil freezing including local building codes regarding subsurface foundation construction.
- Average monthly temperatures and relative humidity readings.

- Maximum depth to permafrost (applicable only to sites in Alaska).
- Data regarding the proposed liner's reactions (cracking, loss of strength, etc.) to the above conditions.

The above climatic data should be available from the nearest office of the National Weather Service. These offices are often located at airports. Building codes can be obtained from local county offices that issue building permits.

Liner manufacturers' data concerning the responses of the proposed liner to the local climatic conditions should be included. Quantitative data should be provided where available. These should include the liner's strength, resistance to tearing and puncture, and other failures as the range of conditions likely to be encountered. The tendency of liners to crack is a particularly important consideration for those that are to be installed in cold climates and thus exposed to a seasonal freeze-thaw cycle. Manufacturers' and other data should be submitted indicating the materials' resistance to cracking.

Applicants may be able to reduce the negative effects of the local climate through proper design techniques and/or selection of materials. A liner installed entirely below the local freeze line will not be subjected to the freeze-thaw cycle and resulting stresses. Materials for the upper (above freeze line) portion of a liner may be manufactured of one material and the lower portion of of another. However, caution should be exercised concerning waste-liner compatibility and the ability to join dissimilar materials, and evidence of adequate strength must be presented.

Installation Stresses

Stresses during installation can come form both below and above the liner. The subgrade or bedding material on which the liner is placed can exert pressure if rocks, roots, or similar materials remain near the surface. Placement of the liner itself and seaming techniques can stress the lines. Action of earth-moving equipment spreading a bedding layer above the liner and installation of a leachate collection system can also stress or damage a liner. The liner system design should take into account these considerations and include the following information:

- State whether a bedding material will be placed above or below the synthetic liner. The thickness, the type of material used, and a drawing of the bedding layer in relation to the placement of the synthetic layer should be provided. Methods to prepare the bedding material surface (discing, compaction, rolling, etc.) should be described. An explanation of how the synthetic liner will be protected from punctures or tears during installation and operation should be provided if a protective bedding layer is not proposed in the design.
- Treatment of bedding material to prevent plant growth (sterilization) should be described.
- Slope of the sides of the unit and the ability of the sides to resist creep or slumping during installation.
- Methods to be used during liner installation to minimize stress and damage, including detailed techniques for field seaming.
- Methods to be used to place bedding material over the liner and specifications for the bedding material.

The liner system design should thoroughly address the above items. This should include engineering drawings, detailed construction specifications, and technical reports, as necessary. More details are available in Chapter 5 of Reference 5.

Operational Stresses

Daily operation of the waste pile will apply stresses to the liner(s). The Liner System Design should account for these stresses and minimize them. Information in the application should include the following:

- Overall layout and filling sequences of the unit(s).
- Traffic patterns at the site, particularly near the edge of the liner(s) and in the portions of the wastepile closest to the liner.
- Soils data indicating that adequate protection will be provided to minimize operational stresses.
- Design considerations that will minimize liner stress.

Specific, technical soils data can be taken from the foundation analysis portion of the Liner System Design. Design and operational factors should minimize stress. The waste pile could be designed for sequential filling, with one portion completely filled before starting another. The second area may have a different entrance and exit, thus reducing traffic stress at the original entrance and exit.

Depending on the soils, climate, and operations, the bedding layer and/or surface roadways, and so forth, may have to be thickened, recompacted, and graded periodically, and otherwise maintained to reduce liner stress. Applicants should consider these possibilities and include them, as appropriate.

If an inspectable liner is planned, operational plans should protect the integrity of the liner. Methods planned for waste removal and liner inspection must be described. The methods used should not damage the liner to the point where it will not fulfill its operational requirements. Particular care must be exercised at points where movement of equipment will be concentrated, such as at the edges of the waste pile or at entrances and exits.

Pressure Gradients

Sources of liner stress other than the above may also be present. These include pressure gradients caused by soil movement, water, or gases either above or below the liner(s). These situations should be considered and a liner with adequate strength and thickness selected. Information in the application should include:

- Potential for the foundation to be partially lost or to become deformed due to piping, sinkholes, decomposition of organic matter, slumping, and so on, and the ability of the liner to withstand such stresses.
- Impact of unexpected changes in water levels above or below the liner(s) such as leachate temporarily deeper than one foot due to heavy storms.
- Potential for generation of gas within the waste contained or present outside the liner.

In addressing information regarding internal and external pressure gradients, the applicant should submit detailed engineering reports demonstrating that the liner system will withstand the various physical stresses throughout the active life of the landfill. Soil-related information may be obtained from the analysis. The soils factors listed above should be considered during site selection, design and permit application, and applied to liner selection. The impact of unusual water conditions should be analyzed. Often, soil-related problems are caused by unusual water situations. It may be wise to assess both together in a near worst-case scenario in the development of Liner System Designs.

The applicant should consider potential gas pressures when designing the liner(s). Gas pressure could develop above, below, and possibly between liners (in a double-lined waste pile). Gases may be generated in the wastes via anaerobic decomposition of organic matter, yielding methane and carbon dioxide (landfill gas), or via other mechanisms. These gases normally migrate to the surface and vent to the atmosphere. However, gas can migrate laterally and/or accumulate in localized areas resulting in pressure on the liner(s). Gases within the waste may transport hazardous constituents. If vented to the atmosphere, these gases may require treatment prior to release.

External gas pressure should also be considered. Gas may be present or be generated beneath a landfill's liner(s). Sites located in soils containing significant amounts of organic matter have potential gas problems. Existing units may be releasing gas to the subsurface. New units built near existing units might be affected by this gas. This is especially true of new hazardous waste landfills adjacent to sanitary landfills, either active or closed.

6.2.2 Leachate Collection and Removal System

6.2.2.1 The Federal Requirement --

Facility Standard 264.251(a)(2) states that a waste pile for an existing portion of a waste pile) must have:

A leachate collection and removal system immediately above the liner that is designed, constructed, maintained, and operated to collect and remove leachate from the pile. The Regional Administrator will specify design and operating conditions in the permit to ensure that the leachate depth over the liner does not exceed 30 cm (one foot).

The leachate collection and removal system must be:

(1) Constructed of materials that are:

(A) Chemically resistant to the waste managed in the pile and the leachate expected to be generated.

(B) Of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and by any equipment used at the pile.

(ii) Designed and operated to function without clogging through the scheduled closure of the waste pile.

6.2.2.2 Guidance to Achieve the Part 264 Standard

6.2.2.2.1 Maximum head of leachate -- To minimize the potential for release of hazardous constituents during the regulated unit's active life, waste piles (except for existing portions) must have a liner and leachate collection and removal system. To reduce pressure head on the liner, the leachate collection and removal system must be designed and operated to assure that leachate depth over the liner does not exceed one foot. The Agency believes that it is practical to design a leachate collection and removal system to maintain leachate depth of 30 cm (1 ft.) or less, except perhaps temporarily during severe storms.

Perhaps the simplest leachate collection system is a series of swales in the liner of waste piles, when using a concrete or asphaltic liner. The liner itself can be slightly sloped, with shallow swales to collect any leachate. The swales could be interconnected, with the leachate directed to a holding facility, sump, tank, or surface impoundment. Since the leachate is considered a hazardous waste, it must be stored or treated in a permitted facility.

Other applicable systems are related to those used in landfills. For such systems, the Agency recommends that the system be constructed of a sand or gravel that is at least 30 centimeters (12 inch) thick with a hydraulic conductivity not less than 1 x 10^{-3} cm/sec and a minimum slope of 2 percent. For additional guidance and rationale for the design of the leachate collection and removal system the applicant should refer to Reference (4). See Figure 8-1 for a generalized diagram of a liner and leachate collection system applicable to waste piles.

6.2.2.2.2 Chemical Resistance -- All leachate collection and removal systems must be designed so they will continue to function throughout the active life of the pile. They must be capable of withstanding the chemical attack that can result from contact with leachate. The leachate from waste piles is likely to be chemically corrosive to many materials. Construction materials, especially for the perforated collection pipes, must resist deterioration for the required operational lifetime. This means that the applicant must have knowledge of the materials included in the waste piles, and also of possible interactions that can occur with the mixing of heterogeneous materials. It is also important to take into consideration the chemical effect of leachate on the pumps to be used for leachate removal.

6.2.2.2.3 Strength and Thickness -- The pipe used in the collection system must be of sufficient strength and thickness to withstand the pressure exerted by the weight of the overlying materials and any equipment to be used on the waste piles. The pipe under consideration is either a rigid conduit, such as concrete and cast iron, or a flexible conduit, such as plastic and fiberglass. Because of the probable corrosive properties of the leachate, plastic or fiberglass are usually the materials of choice. However, there are cases where solvents might be generated which would preclude the use of these latter materials.

Leachate collection pipes beneath waste piles are generally installed in a protective bed of porous material. Perforations will reduce the effective strength of pipe available to carry loads and resist pipe deflection under loading. In addition, the capacity of buried pipe to support vertical stresses may be limited by buckling and by the circumferential compressive strength of the pipe. Deflection, buckling capacity and compressive strength may be obtained from the pipe manufacturer, but should also be calculated for the specific case. A pipe correctly designed to withstand loading from a waste piles can fail from equipment loading received during construction or operation. This loading factor is based on the vertical distance between the loaded surface and the top of the pipe. Moving loads cause impact loading which may have twice the effect of stationary loads. These loads must be considered when choosing pipe material, designing the collection system, and specifying installation techniques. Appendix V of Reference 5 includes methods to calculate these factors.

The leachate collection system should be thick enough to protect the collection and removal pipes. It should also serve as a sump into which leachate drains and is stored prior to and during removal. The leachate system should have a storage capacity such that leachate drains into the system and is removed fast enough so that the wastes are not standing in leachate. Thus, the thickness of the system will depend on factors such as precipitation, control of run-on, and liquid content of the wastes.

6.2.2.2.4 Prevention of Clogging -- The leachate collection and removal system may be overlain by a graded granular or synthetic fabric filter as necessary. The purpose of this is to prevent clogging of the pores in the drainage layer of the collection system by infiltration of fine particles from the waste. If a granular filter is used, it is important that the relationship of grain sizes of the filter medium and the drainage layer be appropriate if the filter is to fulfill its function to prevent clogging of the drainage layer and not to contribute to clogging. EPA guidance specifies a criterion for this purpose which is widely used in construction to prevent clogging (blinding) of drainage media. The criterion was developed by the U.S Army Corps of Engineers and is used in their engineering manuals.

If pipes are used in the leachate collection system, perforations in the pipes should be sized to be compatible with the particle size of the bedding material in the drainage layer. If the perforations are very large compared to grain size of the bedding material, the latter may wash into the collection system and be removed along with the leachate. For additional guidance on the design of the collection and removal system the applicant should refer to References (4),(5), and (6).

6.2.2.3 Guidance to Address the Application Information Requirement --

The applicant should provide engineering reports and detailed drawings to support the proposed design of the leachate collection and removal system. A suggested attachment to the permit application is Leachate Collection and Removal System Design. It should contain the raw data, assumptions, calculations, plans, and specifications for the system. The basic portion of the application should contain a demonstration of how the proposed system meets the requirements of §264.253.

6.2.2.3.1 Overall System Design -- The applicant should provide detailed drawings of the collection and removal systems. These include construction details sufficient to actually build the system and thus assess its adequacy. Specifications for materials to be used and construction techniques should also be included and the following provided:

- Overall system layout, extent, slopes, design of sumps, spacing of pipies, location of pumps and other ancillary equipment.

- Specific information on proposed collection pipes, including materials, size, wall thickness.
- Calculations that show compliance with the requirement that no more than one foot of leachate will exist above the liner except during storms. (Reference 12)

6.2.2.3.2 Chemical Resistance -- The leachate collection system will likely be in the most hostile environment in the waste pile. It must continue to operate even though attacked by solutions of hazardous wastes. Thus, compatibility of the pipes, pumps, and other features with the expected leachate is imperative. Data must be provided indicating that the system will survive the chemical attack of the leachate.

Manufacturers' data may be based only on exposure to one type of waste. Better information may come from operating hazardous waste sites handling similar wastes and using the types of materials proposed. Chemical properties of the leachate and the materials should be presented along with results of any long-term exposure tests.

6.2.2.3.3 Strength and Thickness -- The applicant should submit engineering design calculations that demonstrate that the proposed colleciton system is of sufficient strength and thickness to withstand the pressures exerted by the weight of the overlying landfill, waste cover material, and any equipment to be used in the construction or operation of the landfill. The design calculations should take into account the loads acting on the pipes, the perforation in the pipes, deflection of the pipes caused by the loads, and the buckling capacity and compressive strength of the pipes.

The thickness of the system should also be shown. Rationale for the design of the thickness should be presented. (See Appendix V of Reference 5.)

6.2.2.3.4 Prevention of Clogging -- The applicant should provide information including engineering drawings, specifications, and calculations that demonstrate the ability of the collection system to function without clogging through the scheduled closure of the landfill. Include information about the drainage layer proposed and any proposed filter or pipes. See Reference 4 for assistance in the selection of grain sizes for filters or bedding materials.

6.2.3 Liner and Leachate Collection System Exemption

6.2.3.1 The Federal Requirement --

Part 270.18(c)(1) states:

> If any exemption from the requirement for a liner is sought, as provided by §264.252(b), the owner or operator must submit detailed plans and engineering and hydrogeologic reports as appropriate, describing alternate design and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituents into the ground water or surface water at any future time.

Facility Standard 264.252(b) states:

> (b) The owner or operator will be exempted from the requirements of Paragraph (a) of this section if the Regional Administrator finds, based on a demonstration by the owner or operator, that alternate design and operating practices, together with location characteristics, will prevent the migration of any hazardous constituents (see §264.93) into the ground water or surface water at any future time. In deciding whether to grant an exemption, the Regional Administrator will consider.
>
> (1) The nature and quantity of the waste:

(2) The proposed alternate design and operation:

(3) The hydrogeologic setting of the facility, including attenuative capacity and thickness of the liners and soils present between the pile and ground water or surface water, and

(4) All other factors which would influence the quality and mobility of the leachate produced and the potential for it to migrate to ground water or surface water.

6.2.3.2 Guidance to Achieve the Part 264 Standard --

A variance from the liner and leachate collection and removal requirements is provided if the applicant demonstrates to the Regional Administrator that hazardous constituents will never migrate from the pile into ground water or surface water. This may be due to location aspects, local geology and hydrology, waste characteristics, and other circumstances. The variance may be obtained from any units or portions thereof that are not existing portions.

6.2.3.3 Guidance to Address the Application Information Requirement --

If an exemption from the liner and leachate collection and removal system requirement is being requested for a new unit, the application should provide:

- Locational determinations relevant to assessing the potential for leachate migration, such as soil permeabilities and attentuation capacities, site geology and geohydrology; and
- A demonstration that facility design, locational aspects, and operating practices will prevent the contamination of surface water and ground water at any future time.

A suggested attachment to the permit application is a Report Supporting Request for Exemption from Liner and Leachate Collection and Removal System Requirement.

6.2.4 Control of Run-On

6.2.4.1 The Federal Requirement --

Section 270.18(c) requires that the Part B Application information include:

> (c) Detailed plans and an engineering report describing how the pile is or will be designed, constructed, operated and maintained to meet the requirements of §264.251. This submission must address the following items as specified in §264.251:...
>
> (1) Control of run-on.

Facility Standard 264.251(c) states that to minimize the leachate generation:

> The owner or operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the pile during peak discharge from at least a 25-year storm.

6.2.4.2 Guidance to Achieve the Part 264 Standard --

One of the key elements of EPA's strategy for ground-water protection at waste piles is a liquids management program. This program is intended to minimize leachate generation in the units, primarily by keeping liquids out of the piles. One aspect for limiting the generation of leachate is the requirement that owners or operators control run-on to the unit. The run-on control system must be capable of preventing flow onto the active portion of the pile during peak discharge from at least a 25-year storm.

6.2.4.3 Guidance to Address the Application Information Requirement --

To demonstrate that run-on onto the active portion of the pile during peak discharge from at least a 25-year storm will not occur, the applicant should accomplish the following and submit the results for review and approval. A suggested attachment to the permit application is Run-On Control System Design. The following information and analyses should be submitted:

- A description of the hydrologic method used to estimate peak flow rates including its source and justification for its use in waste pile design;
- All data and input parameters used in conjunction with the selected hydrologic method and their sources;
- All calculations for estimating peak flow rates including a discussion and justification of any necessary assumptions;
- All hydraulic calculations and designs for sizing the necessary collection and conveyance facilities (standard hydraulic techiques and for determining flow capacities, including allowance for freeboard, shall be used).
- Structural designs of collection and conveyance facilities and results of all field tests to ensure compatibility with soils and foundation conditions (standard structural design techniques, safety factors, and appropriate field tests shall be used).
- A maintenance plan for ensuring the structural integrity of the collection and conveyance facilities along with a plan for restoration and repair in the event of a washout failure.
- To maintain capacity of the system, a plan for dewatering any collection or holding facilities associated with run-on control systems should be prepared.

6.2.5 Control of Run-Off

6.2.5.1 The Federal Requirement --

Section 270.18(c) requires that the Part B Application information includes:

> Detailed plans and an engineering report describing how the pile is or will be designed, constructed, operated and maintained to meet the requirements of §264.251. This submission must address the following items as specified in §264.251:...

(3) Control of run-off.

Facility Standard 264.251(d) states that to minimize hazards from run-off of contaminated liquid:

> The owner or operator must design, construct, operate, and maintain a run-off management system to collect and control at least the water volume resulting from a 24-hour, 25-year storm.

6.2.5.2 Guidance to Achieve the Part 264 Standard --

The Agency interprets the run-off regulations in the following ways:

- Run-off from active portions of units will generally be a hazardous waste, because it is presumed to contain leachate. Leachate is generally considered to be a hazardous waste under §261.3(a). However, the permittee has the right to demonstrate that the collected liquid consists only of precipitation run-off for which the mixture rule in §261.3(b)(2) does not apply. Units used to hold hazardous liquids should meet the applicable Part 264 permitting standards (i.e., Subpart K for surface impoundments, Subpart J for tanks, etc.). Run-off quality should be monitored.

- Run-off from fully closed (e.g., capped) units is generally not a hazardous waste, because it has not drained through waste or mixed with leachate. This run-off need not be collected, but it should be managed in a manner designed to protect the final cover as stipulated in §§264.228(b)(4) and 264.310(b)(5). It should be noted, however, that it is useful to monitor closed-area run-off quality to detect leachate seepage through the cap. Units used to hold collected closed-area run-off need not meet the permitting standards associated with the unit type, unless the run-off is a hazardous waste.

- Run-off from portions of a facility that are not part of an active waste pile (undeveloped or unassociated areas) need not be collected in the run-off management systems required under §§264.251(d), 264.273(d), and 264.301(d).

- Run-off volume can be calculated using the methods in the U.S. Department of Agriculture, Soil Conservation Service, National Engineering Handbook 4.

- Collection and conveyance structure designs can be determined using the methods in the U.S. Department of Agriculture, Soil Conservation Service, National Engineering Handbook 5: Hydraulics (7).

- The magnitude of the 24-hour, 25-year storm can be determined by using the data available in the National Oceanic and Atmospheric Administration, Technical Publication 40, with Regional revisions.

Of the three types of run-off from waste piles (active area, closed area, and underdeveloped/unassociated area), the Agency is most concerned with active area control. Precipitation falling on exposed hazardous wastes can dissolve or transport waste constituents. At typical waste piles, precipitation run-off and leachate are likely to mix at the toe of the active face or other low points.

If the permittee does not initially manage active area run-off as a hazardous waste, then he has the continuing obligation to determine whether the liquid meets the definition of a hazardous waste. Run-off is not a listed waste because the "derived from" rule in §261.3(c)(2) does not apply. As a result, run-off will only be considered a hazardous waste if it exhibits one of the characteristics associated with hazardous wastes as outlined in 40 CFR Part 261 Subpart C (§261.3) or if it mixed with leachate or another hazardous waste. Three considerations, however, suggest that it should be easier for the permittee to assume the run-off to be a hazardous waste. First, the practical burden of conducting the waste analysis is likely to outweigh any ultimate benefit incurred as a result of avoiding initial treatment of the run-off as a hazardous waste. Second, testing itself will be difficult because collected run-off cannot be managed easily in batch form; liquid is added to and removed from run-off collection basins continuously. Third, an initial assumption that run-off is hazardous will save the problem of transferring the liquid from a nonpermitted unit to a permitted unit when the liquid is found to be hazardous.

The collection system must be emptied expeditiously after storms to maintain its capacity. The rate and extent of fluid removal are site-specific factors. It might not be necessary to completely drain the system as long as there is sufficient capacity to collect fluid from the 24-hour, 25-year storm. If the fluid is managed in a Subpart K surface impoundment, the impoundment must be designed to prevent overtopping.

The nature of fluid quality monitoring is also a site-specific matter. If the fluid is not presumed to be a hazardous waste (see above), monitoring must determine whether it meets the definition of hazardous waste. If, on the other hand, the fluid is presumed to be a hazardous waste and managed in appropriate units, monitoring should be based on whatever information is needed to manage those units.

The interim status standards for run-off management at existing facilities are found at §265.253 for waste piles. If the leachate or run-off from a waste pile is a hazardous waste, then either the run-off must be collected and managed as a hazardous waste, or the pile must be protected from precipitation and run-off and no liquids may be placed in the pile.

Run-off from disposal units that are closed under the Interim Status Standards need not be collected.

6.2.5.3 Guidance to Address the Application Information Requirement --

A suggested attachment to the permit application is Run-Off Control System Design. The following information and analyses should be submitted for review:

- A description of the hydrologic method and calculations used to estimate peak flow rates and run-off volumes including justification of necessary assumption.
- The 24-hour, 25-year rainfall volume used for facility design including the source of the data; all other data and necessary input parameters used in conjunction with the selected hydrologic method and their sources should be documented and described;
- All hydraulic calculations and designs for sizing the necessary collection, conveyance and storage

  facilities (standard hydraulic techniques for determining flow capacities and storage volumes, including allowances for freeboard, shall be used);
- Structural designs of the collection, conveyance, and storage facilities, and results of all field tests to ensure compatibility with soils and foundation conditions (standard structural design) techniques and factors of safety, and appropriate field tests should be used);
- A maintenance plan for ensuring the structural integrity of the collection, conveyance and storage facilities along with the plan for restoration and repair in the event of a washout or failure.

6.2.6 Management of Units Associated with Run-On and Run-Off Control Systems

6.2.6.1 The Federal Requirement --

Section 270.18(c) requires that the Part B Application information include:

> Detailed plans and an engineering report describing how the pile is or will be designed, constructed, operated and maintained to meet the requirements of §264.251. This submission must address the following items as specified in §264.251:...
>
> (4) Management of collection and holding units associated with run-on and run-off control systems;

Facility Standard 264.251(e) states that

> Collection and holding facilities (e.g., tanks or basins) associated with run-on and run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system.

6.2.6.2 Guidance to Achieve the Part 264 Standard --

Section 264.251(e) states that collection and holding facilities associated with run-on and run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain the design capacity of the system. The specified design capacity is that capacity necessary to collect and control the water volume resulting from a 24-hour, 25-year storm. The system may be designed to meet the above requirements or by designing it for a volume in excess of the 24-hour, 25-year storm capacity. Where additional storage capacity is necessary to allow reuse or delayed disposal of collected water, it can be separately provided by tanks or additional surface impoundments.

The applicant is reminded that run-off from the active area of the landfill should generally be considered hazardous. This will require management of this run-off in permitted treatment, storage, or disposal facilities.

6.2.6.3 Guidance to Address the Application Information Request --

A suggested attachment to the permit application is Plan for Management of Units Associated with Run-On and Run-Off Control. The following information should be submitted:

- A plan for emptying collection or holding facilities associated with run-on and run-off management systems to maintain the capacity of the system.
- An estimation of the length of time it would take to empty the holding facilities.
- A description of the method to be used for collected run-off disposal, such as treatment and discharge, evaporation, and so forth. The description should address any environmental concerns associated with the disposal method.
- A description of the methods to be used to monitor run-off quality.

6.2.7 Control of Wind Dispersal

6.2.7.1 The Federal Requirement --

Section 270.18(c) requires that the Part B application information include:

> Detailed plans and an engineering report describing how the pile is or will be designed, constructed,
>
> operated and maintained to meet the requirements of §264.251. This submission must address the following items as specified in §264.251:...
>
> (5) Control of wind dispersal of particulate matter, where applicable;

Facility Standard 264.25(f) states that:

> If the pile contains any particulate matter which may be subject to wind dispersal, the owner or operator must cover or otherwise manage the pile to control wind dispersal.

6.2.7.2 Guidance to Achieve the Part 264 Standard --

EPA requires wind dispersal controls to minimize emissions of particulate matter at waste piles. Particulate air emissions can be generated during the operation and closure of waste piles. The generation and dispersion of dust from a hazardous waste management site is of concern because of the potential health hazards and safety considerations including impact on visibility near the pile. These emissions are generated primarily from wind erosion of open areas, vehicle traffic on unpaved haul roads, and adding and removing material from piles.

The fugitive emissions produced by wind erosion of waste piles depend on the waste type, moisture content, wind velocity, surface geometry and wind protection. Although many equations have been developed by researchers in estimating emissions generated from agricultural soils, there seems to be a basic agreement that between 2.5 and 10 percent of all the soil eroded due to wind becomes airborne as suspendable particulate matter.

Fugitive dust emissions from unpaved surfaces caused by vehicle traffic on exposed waste surfaces and haul roads are affected by the surface texture of the road, road material, surface moisture, vehicle speed, and level of activity. Fugitive emissions from unpaved surfaces can be estimated using emission factors developed in EPA Publication AP-42, Compilation of Emission Factors. Factors that must be known include: the silt content of the surface materials (percentage of weight of particles smaller than 75 micrometers in diameter), average vehicle speed, and average daily traffic.

Chemical stabilizers can be added to reduce wind erosion. Many of the compounds are proprietary developments, and their properties are difficult to evaluate without site-specific field testing. In selecting a stabilizer, one should consider effectiveness, stability, ease of application, cost, safety, and environmental impact. Most chemical stabilizers only provide dust suppression for a limited period of time, generally no more than a few months; thereafter, a reapplication or more permanent solution is needed.

The geometry and orientation of waste piles can aid in reducing wind dispersal. Low piles and those with their long dimension parallel to the prevailing winds will likely have the fewest problems with wind dispersal.

Windbreaks such as trees and fences may assist in minimizing wind dispersal. Waste piles may also be amenable to man-made windbreaks. The best possible protection is to completely enclose a waste pile in a building.

6.2.7.3 Guidance to Address the Application Information Requirement --

The applicant should assess the potential for wind dispersal. This may be based on factors such as type of waste(s) disposed, predominant wind direction and velocity, local topography, windbreaks, and operational procedures. The approach used in this assessment and the results should be included in the basic portion of the application.

If the assessment indicates a potential for wind dispersal, a control plan must be developed. A suggested attachment to the permit application is Wind Dispersal Flow Control Plan.

The applicant should submit the following information on wind dispersal control:

- A description of the method(s) proposed for controlling wind dispersal. Include such considerations as the siting of the waste pile; the use of water sprays, dust suppressants other than water, stabilizers, windbreaks, and enclosures. Particular attention should be paid to including plans to minimize wind dispersal during the addition and removal of wastes from the piles.
- Data supporting the effectiveness of the proposed wind dispersal control technique(s).

6.2.8 Ground-Water Protection Exemption for Double-Lined Piles

6.2.8.1 The Federal Requirement --

If the applicant desires exemption from the ground-water protection standards because he proposes a double-lined waste pile, section 270.18(c) requires that the Part B application include:

> If an exemption from Subpart F of Part 264 is sought as provided by §§264.252 or 264.253, submit detailed plans and an engineering report describing how the requirements of §§264.252(b) or 264.253(a) will be complied with;

Facility Standard 264.252(a) states:

> The owner or operator of a double-lined wastepile is not subject to regulation under Subpart F of this part in the following conditions are met:
>
> (1) The pile (including its underlying liners) must be located entirely above the seasonal high water table.
>
> (2) The pile must be underlain by two liners which are designed and constructed in a manner that prevents the migration of liquids into or out of the space between the liners. Both liners must meet all the specifications of 264.251(a).

(3) A leak detection system must be designed, constructed, maintained, and operated between the liners to detect any migration of liquids into the space between the liners.

(4) The pile must have a leachate collection and removal system above the top liner that is designed, constructed, maintained, and operated in accordance with §264.251(a)(2).

6.2.8.2 Guidance to Achieve the Part 264 Standard --

The design and operating standards contain special sets of standards for waste piles with double liners and leak detection systems. Compliance with these standards is not mandataory. However, if an applicant voluntarily applies for and is issued a permit to comply with these special standards (in addition to the other standards generally applicable to these units), he is not subject to the ground-water protection regulations contained in Subpart F.

To be eligible for exemption from ground-water protection requirements, a double-lined unit (including the liners and leak detection system) must be placed entirely above the seasonal high water table. Placement of units in the ground water poses special problems including those associated with external pressures applied by the saturated earth. The Agency is concerned that these pressures can cause disruption (collapse or caving in) of the liner system and disruption of the leak detection system to the point that it may not work. While collapse of the liner system can occur when a single liner unit is located in the ground water, the ground-water monitoring system can be expected to function to detect contamination. Since ground-water monitoring is waived for double-lined facilities, it is imperative that the leak detection system function. The Agency is not confident at this time that it can specify design safeguards that will ensure continued function when the unit is placed in the saturated zone.

The foundations on which the liners are installed must be graded to allow for free, gravity flow of liquid to the leachate collection system and the leak detection system. A minimum slope of two percent is recommended. Guidance is provided in Reference 3.

The regulations require that the liners used must meet the requirements normally applicable to liners in single-liner systems, i.e., they must each prevent the migration of wastes to subsurface soil or to ground water or surface water during the life of the unit. Applicants seeking this exemption will have to ensure that each of the liners prevent migration into or out of the space between the liner. Otherwise, leakage into the leak detection system will occur, resulting in the need to repair or replace the leaking liner or begin ground-water monitoring. One approach to minimize migration between the liners is to seal the edges of synthetic membrane liners at the surface.

The leachate collection and removal requirements for single-liner piles also apply to double-lined systems. The leachate collection and removal system must be placed above the upper liner, and must be maintained and operated to collect and remove the leachate. This implements the policy objective of reducing the amount of leachate that can potentially migrate to the subsurface soil, ground water or surface water.

The leachate collection system should be installed in a drainage layer above the upper liner. This layer should be at least 30 cm (1 ft) thick and have a hydraulic conductivity of not less than 1 X 10^{-3} cm/sec. Any pipe used in the collection system must be strong enougn to withstand the pressures of overlying waste and movement of equipment. Strength attributes of perforated pipes must be considered in the design of the collection systems.

Proper spacing of the pipe network to ensure adequate liquid collection is important. A reasonably sized drainage system and adequate removal methods will provide an extra measure of protection by reducing the liquid head (see Reference 3).

A leak detection system is any system (a drain and pump or appropriate instrumentation) that enables the permittee of the waste piles to detect whether any liquid has entered into the space between the liners. This is the means by which the permittee will determine if the liner has failed or is leaking. Some water may enter the space between the liners at the time of installation. This would occur only once, at the time of unit start-up. A prudent permittee would remove this water immediately, since the presence of water in the leak detection system at a later time will be assumed to indicate that one of the liners is leaking. Failure or leakage of the liner requires the permittee to notify the Regional Administrator and either to repair the primary liner or institute ground-water monitoring, pursuant to §264.98.

Many designs of detection systems have been devised using advanced instrumentation, such as resistivity and conductivity measurement systems. However, direct collection and removal of liquid leakage is perhaps the simplest and most reliable method. This system is very similar to leachate collection systems for surface impoundments and landfills. A series of perforated pipes is placed in a porous medium between liners during construction. Liquid that has penetrated the upper liner collects in these pipes and flows by gravity to a central drain or gallery, where the liquid can be detected and withdrawn. EPA suggests that 10 cm. (4-inch) diameter perforated pipe on 15 to 60 m. (50 to 200 ft.) centers should be adequate to provide effective leak detection and capacity to remove liquids from minor breaching in the primary (upper) liner.

Ordinarily, a permit written for a double-lined unit seeking an exemption from Subpart F would not contain detection monitoring requirements. In that case, if the permittee discovers a leak in the leak detection system, he will have to repair or replace the leaking liner or be in violation of the permit. Therefore, EPA recommends that those who anticipate retrofitting problems in attempting to repair or replace leaking liners should request that detection monitoring programs be established in their permits in accordance with the requirements of §264.98, as contingent requirements. Such requirements would be automatically triggered in the event of a leak, but would not have to be complied with until such a leak occurred. The permit would specify well placement, detection parameters to be monitored, and the frequency of monitoring. If a leak occurred, the permittee would then install the wells and begin monitoring in accordance with a schedule set forth in the permit.

6.2.8.3 Guidance to Address the Application Information Requirement --

A waste pile must not be located within the saturated zone in order to qualify for the exemption described in §264.252(a). Many fine-grained geologic formations may not meet the characteristics of an aquifer, but may be saturated nonetheless. A waste pile constructed in such a formation would be within the ground-water table, and could not qualify for the exemption. The applicant should submit the following information if application is being made for the ground-water monitoring program exemption:

- A demonstration that the wastepile and its underlying liners will be located entirely above the seasonal high ground-water table. The applicant should refer to Section 9.3 of the manual for guidance on how to describe the hydrogeologic characteristics of the facility's location.
- A demonstration that both liners satisfy the requirements of §264.251 (a)(1). The applicant should refer to Section 8.2.1 for guidance on how to demonstrate compliance with this standard for each liner. For those cases in which two different types of liner material are to be used, a liner integrity analysis (i.e., waste liner capability test) for both liners must be submitted.

- A demonstration that the leak detection system between the two liners will be designed, constructed, maintained, and operated to detect any migration of liquid into the space between the liners. EPA recommends that the leak detection system resemble the leachate collection and removal system. If the top liner leaks, a leachate collection and removal system will be present beneath it for immediate operation. The applicant can refer to Section 8.2.2 for guidance on leachate collection and removal system design.
- A demonstration that the leachate collection and removal system above the top liner satisfies the standard in 1264.251(a)(2). The applicant can refer to Section 8.2.2 for guidance in leachate collection and removal system design.

A suggested attachment to the permit application in Report Supporting Request for Exemption from Ground-Water Protection Requirement for Double-Lined Waste Piles.

6.2.9 Ground-Water Protection Exemption for Piles with Inspectable Liners

6.2.9.1 The Federal Requirement --

Facility Standard 264.253(a)(3) states:

> The owner or operator of a pile is not subject to regulation under Subpart F of this part if the following conditions are met.
>
> (3) The wastes in the pile must be removed periodically, and the liner must be inspected for deterioration, cracks, or other conditions that may result in leaks. The frequency of inspection will be specified in the inspection plan required in §264.15 and must be based on the potential for the liner (base) to crack or otherwise deteriorate under the conditions of operation (e.g., waste type, rainfall, loading rates, and subsurface stability).

6.2.9.2 Guidance to Achieve the Part 264 Standard --

The permittee of a waste pile is not subject to Subpart F regulation if the wastes in the pile are removed periodically and the liner inspected for integrity. This allows the liner to be visually inspected to determine that the performance standards are being achieved. The permittee can then determine if hazardous constituents, leachate,and so forth have been prevented from entering the ground or surface water. This exemption is most applicable to piles where the wastes are normally removed as part of the overall management plan.

Waste piles with a coated concrete or asphaltic liner are the best candidates for this exemption. Such piles will likely have the structural strength to allow the periodic removal of the waste, inspection, and replacement of the waste. Wastes removed to allow inspection must be managed as hazardous wastes and either moved to another portion of the permitted waste pile, or to some other permitted treatment, storage, or disposal facility.

6.2.9.3 Guidance to Address the Application Information Requirement --

The applicant is required to submit documentation including detailed plans, engineering reports and operating plans to show how §264.253(a)(3) will be achieved. Detailed operating plans must describe how the wastes will be removed without damaging the liner. A suggested attachment to the permit application is Report Supporting Request for Exemption from Ground-Water Monitoring Requirements - Piles with Inspectable Liner. Information to be submitted should include at least the following:

- Information concerning the liner that demonstrates that the liner can withstand the stresses of periodic waste removal and replacement including:
    - -- type of and specifications for liner, including reinforcement
    - -- type of coating(s) to be used to seal the liner

- Equipment to be used, including operating procedures to minimize liner stress.
- Inspection procedures, including frequency, methods, and documentation.
- Contingency plans for liner repair/replacement if cracks or deterioration are found.

6.3 MONITORING AND INSPECTION

6.3.1 Monitoring and Inspection During Construction, Installation, and Operation

6.3.1.1 The Federal Requirement --

Section 270.18(e) requires that the Part B Application include:

> A description of how each waste pile, including the liner and appurtenances for control of run-on and run-off, will be inspected in order to meet the requirements of §264.254(a) and (b). This information should be included in the inspection plan submitted under 270.14(b)(5) of this section. If an exemption is sought to Subpart F of Part 264 pursuant to §264.253, describe in the inspection plan how the inspection requirements of §264.253(a)(3) will be complied with.

The Facility Performance Standard 264.254(a) states:

> During construction or installation, liners (except in the case of existing portions of piles exempt from §264.251(a) and cover systems (e.g., membranes, sheets, or coatings) must be inspected for uniformity, damage, and imperfections (e.g., holes, cracks, thin spots, or foreign materials). Immediately after construction or installation:
>
> (1) Synthetic liners and covers must be inspected to ensure tight seams and joints and the absence of tears, punctures, or blisters; and
>
> (2) Soil-based and admixed liners and covers must be inspected for imperfections including lenses, cracks, channels, root holes, or other structural non-uniformities that may cause an increase in the permeability of the liner or cover.

The Facility Performance Standard 264.254(b) states:

While a waste pile is in operation, it must be inspected weekly and after storms to detect evidence of any of the following:

(1) Deterioration, malfunctions, or improper operation of run-on and run-off control systems;

(2) The presence of liquids in leak detection systems, where installed to comply with §264.252;

(3) Proper functioning of wind dispersal control systems, where present; and

(4) The presence of leachate in and proper functioning of leachate collection and removal systems, where present.

6.3.1.2 Guidance to Achieve the Part 264 Standard --

6.3.1.2.1 Liner Inspection -- Synthetic liner and cover systems must be inspected during construction and installation for uniformity, damage and imperfections, and after installation to ensure tightness of seams and joints and absence of tears, punctures, or blisters. Soil-based and admixed liners and covers must be inspected for imperfections including lenses, cracks, channels, root holes or other structural non-uniformities that may adversely affect the permeability, strength, or other engineering properties of the liner or cover. The applicant should consult the EPA publication on liners (Reference 5) for information on specific inspection needs and objectives for various liners. Information on evaluating cover systems is available in Reference (8).

An effective quality control program will form the basis for the inspection plan for the installation and construction of liners. The applicant should propose a Liner Installation Quality Control Program (QC) which addresses the proposed metho of liner inspection, testing and documentation. The QC Program may be developed, in part, from manufacturers' standard inspection procedures. For example, for a synthetic liner, it should include, but not be limited to, the following specific provisions:

- The permittee will designate a field representative (QC Manager) with sole responsibility for inspection and approval of liner work. For large projects, the permittee should provide a sufficient number of personnel to assist the QC Manager to achieve the objectives of the QC Program.
- QC Program should include assurance that the following objectives are met:
  - -- The construction specifications required in the permit are fully implemented;
  - -- Subgrade preparation is consistent with requirements for synthetic liner membranes;
  - -- Handling of liner materials is performed in accordance with manufacturer's recommended procedures;
  - -- Manufactured liner panels, upon arrival at the project site, are free of product defects and damage resulting from shipping;
  - -- Fabricated seams of prefabricated sheet membranes are tested by airlance, vacuum or other suitable means to determine location of defects;
- Liquid-applied membranes, adhesives, and solvents are delivered in sealed containers and are used in accordance with the manufacturer's recommendations.
- Contractor's tools are consistent with manufacturer's recommendations; sharp instruments such as pointed scissors are not allowed.
- Field seams constructed by adhesive, heat, welding or other means are tested by airlance, vacuum, ultrasonic method or by any combination of methods to determine the location of defects.
- Placement of soil and protective cover is accomplished so that the soil is free of deleterious materials, and in a manner such that damage is not caused to the liner membrane by disposal operations.

- Samples of liner material, fabrication seams and field seams are taken routinely in sufficient number to verify the quality of workmanship of the completed work.
- Laboratory testing of field samples is conducted in accordance with ASTM standards and procedures for synthetic liner membranes. Results should be reviewed by the QC Manager and corrective action taken if materials and seams do not meet minimum specified strengths. The permittee should notify the Regional Administrator of such corrective action and make all test results available for review upon request.
- Documentation of all phases of the QC Program should be prepared by the permittee for record purposes. Daily reports should be maintained by the QC Manager describing observations, activities, weather, production, contractor's equipment, and work force and specific problems. Deviations from standard construction procedures by the contractor, corrective measures, and changes in design should be fully documented. Location of field samples and laboratory test results should be made a part of program documentation.

Soil-based and admixed liners and covers must be inspected and tested to ensure that they are properly constructed according to the approved design. The test data should consist of strength, permeability and other material properties of samples representative of the liner or cover to be used in construction.

To ensure that the liner and cover system are constructed according to the approved design and specifications, and to ensure uniformity, absence of damage, and imperfections, an independent test lab and inspector supervised by a qualified, registered engineer should be present at all phases of construction and installation to monitor and test the materials as they are placed. Non-destructive or destructive sampling and testing should be performed on a random basis in accordance with established, acceptable standards. In destructive sampling and testing, the areas sampled or tested should be restored to original condition immediately after sampling or testing. All test results and other pertinent data, such as location, elevation, date, climatic conditions, personnel, and so forth, should be documented and kept on record.

6.3.1.2.2 Operation Inspection -- In addition to inspections during construction and installation, qualified personnel must make inspections of a waste pile while it is in operation. These inspections must be conducted weekly and after storms. A detailed written schedule should be developed for inspection of: (a) run-on and run-off control systems, (b) leak detection systems, (c) wind dispersal control system, and (d) leachate collection and removal system.

The inspection records should include the maintenance and calibration records of all control systems, leak detection systems, and leachate collection and removal systems. Furthermore, the amount of leachate present in the collection and removal system should be recorded. All information from each inspection should be documented and kept on record for EPA review.

The applicant is advised that additional general inspection requirements are delineated in §264.15(b) of the general facility standards. The corresponding permit information requirements for these requirements are provided in §270.14(b)(5). Guidance on these overall inspection requirements is provided in the Permit Applicants' Guidance Manual for General Facility Standards (Reference 1).

6.3.1.3 Guidance to Address the Application Information Requirement --

The following information on inspection should be submitted with the permit application. The applicant should include this information in the overall Facility Inspection Plan as required under §270.14(b)(5). Two suggested attachments within the Facility Inspection Plan submitted with the permit application are a Liner Construction Inspection Plan and an Operation Inspection Plan.

6.3.1.3.1 Liner Inspection Plan --

- Describe procedures, including a quality control program, for inspecting synthetic liners and covers during construction and installation. The applicant should address all inspection needs discussed above for synthetic liners and covers.
- Describe procedures, including a quality control program, for inspecting soil-based and admixed liners and covers during construction and installation. The applicant should address all inspection needs discussed above for soil-based and admixed liners and covers.

6.3.1.3.2 Operation Inspection Plan --

- Describe the procedures for inspecting weekly and after storms for detection of:
  - -- deterioration, malfunction, or improper operation of run-on and run-off control systems;
  - -- presence of liquids in the leak detection system, where installed,
  - -- proper functioning of wind dispersal control systems; and
  - -- presence of leachate in and the proper functioning of leachate collection and removal system, where present.

6.3.2 Monitoring and Inspection of Liner if Exemption from Ground-Water Protection Requirements is Sought

6.3.2.1 The Federal Requirement --

The Facility Performance Standard 264.253(a)(3) states:

> (a) The owner or operator of a pile is not subject to requlation under Subpart F of this part if the following conditions are met:
>
> (3) The wastes in the pile must be removed periodically, and the liner must be inspected for deterioration, cracks, or other conditions that may result in leaks. The frequency of inspection will be specified in the inspection plan required in §264.15 and must be based on the potential for the liner (base) to crack or otherwise deteriorate under the conditions of operation (e.g., waste type, rainfall, loading rates, and subsurface stabiity).

6.3.2.2 Guidance to Achieve the Part 264 Standard --

Section 264.253 provides a special exemption from Subpart F for any waste pile where the waste is periodically removed from the liner so that the liner may be inspected for cracks, erosion, or other conditions that could result in leakage. This exemption relies on inspection of the liner to assure that the liner is intact and is not allowing leachate to migrate through it. This inspection procedure eliminates any need to monitor the ground water.

Synthetic membrane liners are not likely to be capable of withstanding damage from repeated removal and replacement of wastes during liner inspections. Clay liners will also be unsuitable in many cases, because when exposed to air, they tend to dry out to some extent and crack, resulting in the development of channels through which leachate may migrate. Therefore, EPA expects that reinforced concrete with appropriate coatings will be the liner material chosen by most applicants wishing to qualify for an exemption under §264.253.

The regulations further provide that the inspection plan usually required by §264.15 will incorporate a schedule of inspection which includes periodic removal of the waste and testing of the liner to ensure that it has not deteriorated to where it is no longer capable of containment or is already leaking.

This exemption is intended for, and will likely apply to small piles, especially those where normal operations periodically or routinely result in removal of the waste. Removal of the waste from large piles on a periodic and routine basis would normally be impractical because of handling and storage difficulties. Large piles will also need a relatively permeable drainage layer and possibly a drainage system to comply with the one-foot leachate head requirement. To remove the wastes and drainage layers from such piles in order to meet the inspection requirement will, normally, be impractical. The regulations do not specify the pile size in an exemption, but the practicality of both inspecting the liner and meeting the one-foot head requirement will limit the size in practice.

When the waste is removed, the integrity of the liner must be thoroughly inspected by qualified personnel. The types of inspections and tests required for synthetic liners and covers, and soil based and admixed liners and covers have been discussed in the preceding paragraphs of this section. However, the EP expects that reinforced concrete with appropriate coatings will be chosen most often by those wishing to qualify for exemption under §264.253. For tests to evaluate these liners, the following references can be used:

> Asphalt in Hydraulics, The Asphalt Institute, Manual Series No. 12, November 1976.
>
> Linings for Irrigation Canals, Bureau of Reclamation, U.S. Dept. of the Interior, Washington, D.C., 1963.

All test results and other pertinent data from each inspection should be documented and kept on record for Agency review.

6.3.2.3 Guidance to Address the Application Information Requirement --

A detailed written inspection plan must be developed and submitted with the permit application to the EPA for evaluation. A suggested attachment to the permit application is Liner Inspection Plan. The inspection plan must specify the frequency of inspections based on the potential of the liner to deteriorate under the conditions of operation. The active life of the facility is a consideration when design and operating requirements for the facility are formulated. Sections 6.2.1 through 6.2.4 mention the testing requirement to predict the liner performance under operating conditions. The results of these tests will give an indication as to the proper inspection intervals.

6.4 EXEMPTION TO LINER STANDARD AND GROUND-WATER PROTECTION STANDARD

6.4.1 The Federal Requirement

Section 270.18(b) states the Part B permit requirement as:

> If an exemption is sought to §264.251 and Subpart F of Part 264 as provided by §264.250(c), an explanation of how the requirements of §264.250(c) will be complied with.

Section 264.250(c) states the facility standard as:

> The owner or operator of any waste pile that is inside or under a structure that provides protection from precipitation so that neither run-off nor leachate is generated is not subject to regulation under §264.251 or under Subpart F of this part, provided that:

(1) Liquids or materials containing free liquids are not placed in the pile;

(2) The pile is protected from surface water run-on by the structure or in some other manner;

(3) The pile is designed and operated to control dispersal of the waste by wind, where necessary, by means other than wetting; and

(4) The pile will not generate leachate through decomposition or other reactions.

6.4.2 Guidance to Achieve the 264 Standard

If an applicant can demonstrate to the Regional Administrator that the use of alternate design and operating practices, in combination with location and waste characteristics, will prevent the migration of any hazardous constituents into the ground water or surface water at any future time, an exemption from the liner and the leachate collection and removal requirements may be issued. The basis for the exemption is that such requirements become superfluous if there is no potential threat to ground water or surface water. Specifically, an exemption from both the liner and leachate collection and removal standards and the ground-water requirements may be provided for dry piles that are inside or under structures protected from precipitation, run-on and wind dispersal.

5.4.3 Guidance to Address the Application Information Requirement

In order to meet the above requirements the applicant should submit information that includes the following. A suggested attachment to the permit application is Report Supporting Request for Exemption from Liner and Ground-Water Protection Standards.

- Documentation concerning the waste generation and handling processes, and the waste characteristics to show that no liquids or materials with free liquids have been or will be placed in the waste pile.
- Documentation, details, drawings, and engineering analyses showing that the waste pile is or will be protected from run-on or precipitation by a structure or other means.
- Documentation showing that the waste pile has or will have adequate control and protection against wind erosion and dispersal.
- Documentation and engineering analyses showing that leachate generation has not or will not occur through decomposition or any other reaction.

6.5 TREATMENT OF WASTE

6.5.1 The Federal Requirement

Section 270.18(f) requires that the Part B application include:

> If treatment is carried out on or in the pile, details of the process and equipment used, and the nature and quality of the residuals;

6.5.2 Guidance to Achieve the Part 264 Standard

There are no specific 264 standards addressing the manner in which the waste pile is to be treated.

6.5.3 Guidance to Address the Application Information Requirement

If treatment is carried out on or in the pile, the treatment program must be carefully researched and designed. A suggested attachment to the permit application is Waste Treatment Plan.

The design and operating measures must include all details of the process and equipment to be used during operation. A thorough analysis of the wastes in the pile should be made prior to treatment. Field and/or laboratory testing of the treatment wastes should be carefully documented. The treatment program must ensure careful management, operation, and maintenance of the waste pile.

Materials (residuals) remaining in the pile after treatment should be analyzed to determine their hazardous nature. If hazardous, they must eventually be disposed in a hazardous waste disposal site. If non-hazardous, they may be disposed in a sanitary landfill or by other methods.

Careful recordkeeping is an important part of the management of the waste pile. The records should include all details of the treatment, including dates, personnel, equipment numbers, and analytical results.

Specific areas to be addressed in the permit application include at least the following:

- Name of the treatment process to be applied to each waste.
- Reference to the literature or to test results indicating that the process is applicable to the waste and is effective.
- List of chemicals or other materials to be added to the wastes.
- Operational procedures including analyses of the residue from the treatment process.
- Recordkeeping procedures.

6.6 SPECIAL REQUIREMENTS FOR IGNITABLE OR REACTIVE WASTES

6.6.1 The Federal Requirement

Section 270.18(g) requires that the Part B Application include:

> If ignitable or reactive wastes are to be placed in a waste pile, an explanation of how the requirements of §264.256 will be compiled with;

The Facilty Performance Standard 264.256 states:

> Ignitable or reactive waste must not be placed in a waste pile unless:
>
> (a) The waste is treated, rendered, or mixed before or immediately after placement in the pile so that:
>
> (1) The resulting waste, mixture, or dissolution of material no longer meets the definition of ignitable or reactive waste under §264.21 or 261.23 of this chapter, and
>
> (2) Section 264.17(b) is complied with;
>
> (b) The waste is managed in such a way that it is protected from any material or conditions which may cause it to ignite or react.

6.6.2 Guidance to Achieve the Part 264 Standard

The regulations require the permittee to take precautions to prevent accidental ignition or reaction of ignitable or reactive waste and protect the waste from sources of ignition. The permittee is also required to take precautions in treating, storing, or disposing of ignitable, reactive or incompatible waste so that it does not ignite or explode, emit toxic gases, damage the containment structure or through other like means threaten human health or the environment.

Section 264.256 prohibits the placement of ignitable or reactive wastes in a waste pile, unless the waste is made non-ignitable or non-reactive, as defined in §§261.21 and 261.23, while also complying with §264.17(b). In addition, §264.229 allows the placement of ignitable or reactive waste in a waste pile if the waste is protected from ignition or reaction.

6.6.3 Guidance to Address the Application Information Requirement

The applicant should submit the information defined below. A suggested attachment to the permit application is Ignitable and/or Reactive Wastes Management Plan(s).

- Description of how ignitable or reactive wastes will be identified when received at the site (should also be included in the Waste Analysis Plan).
- Description of the procedure for treating, or mixing the ignitable or reactive wastes before or immediately after placement in the waste pile.
- Results of laboratory or field experiments that demonstrate that after treatment or mixing and placement in the waste pile, the reactive or ignitable waste will be rendered non-reactive or non-ignitable.
- A description of how §264.17(b) will be complied with (i.e., describe what precautions will be taken to prevent reactions which: (1) generate extreme heat or pressure, fire or explosions, or violent reactions; (2) produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment; (3) produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosion; (4) damage the structural integrity of the device or facility, and (5) through other like means threaten human health or the environment.

6.7 SPECIAL REQUIREMENTS FOR INCOMPATIBLE WASTES

6.7.1 The Federal Requirement

Section 270.18(h) requires that the Part B application include:

> If incompatible wastes, or incompatible wastes and materials will be placed in a waste pile, an explanation of how §264.257 will be complied with;

Facility Standard 264.257 states:

(a) Incompatible wastes, or incompatible wastes and materials, (see Appendix V of this part for examples) must not be placed in the same pile, unless §264.17(b) is complied with.

(b) A pile of hazardous waste that is incompatible with any waste or other material stored nearby in containers, other piles, open tanks, or surface impoundments must be separated from the other materials, or protected from them by means of a dike, berm, wall, or other device.

(c) Hazardous waste must not be piled on the same base where incompatible wastes or materials were previously piled, unless the base has been decontaminated sufficiently to ensure compliance with §264.17(b).

6.7.2 Guidance to Achieve the Part 264 Standard

The potential dangers from the mixing of incompatible wastes and materials include extreme heat; fire; explosion; violent reaction; production of toxic mists, fumes, dusts, or gases; and damage to the structural integrity of the waste pile. Clearly, the potential impacts on human health or the environment which could result from such conditions must be avoided. A list of incompatible wastes is included in Section 7.9.2. Additional guidance on imcompatibility can be found in References (9) and (10).

6.7.3 Guidance to Address the Application Information Requirement

A suggested attachment to the permit application is Management Plan for Incompatible Wastes. The applicant should first determine whether incompatible wastes and/or materials will be landfilled by following the subsequent steps and by providing the information in the permit application:

- Review the lists of incompatible wastes in Section 7.9.2 and identify any that may be received.

- Identify other wastes to be disposed that are not shown in Section 7.9.2.

- Determine if any mixture of these wastes or materials is incompatible and identify the wastes and nature of the incompatibility. [Note: If available, the applicant may use Reference 9, A Method for Determining Compatibility of Wastes, as an aid in determining compatibility of wastes. This document, however, should be used with the caution advised in Section 3.4.3.2 of this Manual.]

If incompatible wastes and/or materials will be stored in the waste pile, the applicant must describe:

- Methods for identifying these wastes as they are received at the site.

- Step-by-step procedures for managing incompatible wastes or material to prevent undesirable reactions or effects defined in §264.17(b);

- Laboratory or field data demonstrating that incompatible wastes can be safely managed at the waste pile using the proposed procedures.

6.8 CLOSURE

6.8.1 The Federal Requirement

Section 270.18(i) requires that the Part B Application include:

> A description of how hazardous waste residues and contaminated materials will be removed from the waste pile at closure, as required under §264.258(a). For any waste not to be removed from the waste pile upon closure, the owner or operator must submit detailed plans and an engineering report describing how §264.310(a) and (b) will be complied with. This information should be included in the closure plan and, where applicable, the post-closure plan submitted under 270.14(b)(13).

Facility Standard 264.258 states:

(a) At closure, the owner or operator must remove or decontaminate all waste residues, contaminated containment system components (liners, etc.), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste unless §264.3(d) of this chapter applies.

(b) If, after removing or decontaminating all residues and making all reasonable efforts to effect removal or decontamination of contaminated components, subsoils, structures, and equipment as required in Paragraph (a) of this section, the subsoils can be practicably removed or decontaminated, he must close the facility and perform post-closure care in accordance with the closure and post-closure care requirements that apply to landfills §264.310.

(c) (1) The owner or operator of a waste pile that does not comply with the liner requirements of §264.25(a)(1) and is not exempt from them in accordance with §§264.250(c) or 264.251(b) must:

(i) Include in the closure plan for the pile under §264.112 both a plan for complying with paragraph (a) of this section and a contingent plan for complying with paragraph (b) of this section in case not all contaminated subsoils can be practicably removed at closure, and

(ii) Prepare a contingent post-closure plan under §264.118 for complying with paragraph (b) of this section in case not all contaminated subsoils can be practicably removed at closure.

(2) The cost estimates calculated under §§264.142 and 264.144 for closure and post-closure care of a pile subject to this paragraph must include the cost of complying with the contingent closure plan and the contingent post-closure plan, but are not required to include the cost of expected closure under paragraph (a) of this section.

6.8.2 Guidance to Achieve the Part 264 Standard

Since waste piles are storage facilities, all wastes, residues, and contaminated subsoils and equipment must be removed or decontaminated at closure. This is necessary because under this option, no post-closure care or monitoring is required. The waste pile is a storage unit leaving no hazardous constituents in the ground after closure. All the removed residues, subsoils and equipment must be managed as hazardous wastes unless the provisions of §264.3(d) are complied with.

If the permittee removes or decontaminates all wastes and waste residues and makes all reasonable efforts to remove or decontaminate all contaminated containment systems, subsoils, structures, and equipment, and finds after such efforts that some contamination remains that he cannot remove or decontaminate, then the pile will be considered a disposal unit under these regulations and must be closed in accordance with the closure requirements for landfills. Thereafter, the permittee must comply with the landfill post-closure requirements.

This situation is likely to occur often in the case of existing portions that do not have liners or have inadequate liners. In a few cases, liners installed in accordance with the requirements of §264.251 of these regulations may also fail. In any of these cases, contamination may have migrated a considerable distance from the waste pile and possibly even entered the ground water. This situation necessitates closure under the landfill closure requirements to minimize the rate of migration and to monitor for potential ground-water contamination. In contrast, facilities with good liners that do not fail will be able to avoid post-closure responsibilities.

A "reasonable effort" to remove all contaminated subsoils includes removal of all wastes and waste residues in the unit all contaminated liners and equipment, and at least some subsoil. The Agency considers that contamination has been removed when the concentrations of hazardous constituents in the remaining in situ soil are at background levels. After making reasonable attempts to remove all contaminated subsoil and failing thereby to remove all contaminated subsoil, the permittee may then cease further removal attempts but must close the unit and perform post-closure activities as he would do in the case of a landfill.

EPA separately considered two types of units: (1) those that do not have liners that comply with the design standard for preventing migration (i.e., most existing portions), and (2) those that do have such liners.

Piles that lack liners that meet the design standards, by definition, do not prevent the migration of wastes to the subsurface soil or ground or surface water. At best, they minimize such migration, and at worst, they provide little or no control. At these units, it will often not be possible to remove all contaminated soils at closure. In some instances, leachate may already have contaminated the ground water. (See Section 9.0 regarding ground-water protection). It is thus reasonable to conclude that, in many instances, such piles will have to be closed as landfills and will require post-closure maintenance and monitoring. Therefore, EPA is requiring that such storage piles have: (1) closure plans to remove or decontaminate the wastes, waste residues, and contaminated equipment and soils; (2) contingent closure plans to cover the units as landfills; and (3) contingent post-closure plans to perform post-closure monitoring and maintenance. The contingent plans must be followed only if compliance with the primary closure plan does not result in the removal of all contaminated soils.

Applications for waste piles that have liners designed to prevent migration are not required to prepare contingent closure plans to close the units as landfills or contingent post-closure plans to maintain and monitor the units. However, in some cases, a liner will fail to meet its design objective of preventing migration throughout the unit's life. In such a case, the permittee will need to obtain a permit modification that imposes final cover requirements as well as post-closure monitoring and maintenance requirements. Further guidance is provided in Section 8.3, Closure of Landfills.

6.8.3 Guidance to Address the Application Information Requirement

The applicant must submit documentation including detailed plans, engineering reports, and operating plans showing that the Section 264.258 standard wil be complied with. A description and plan of how the wastes, waste residues and contaminated materials will be removed from the waste pile at closure is required. For waste piles, proposed or existing, not meeting the previously mentioned standards, contingent closure plans or closure in accordance with Section 264.310 may be required. A suggested attachment to the permit application is Closure Plan.

Information in the Closure Plan should include, but not be limited to the following:

- Planned ultimate disposition of the wastes, liner, and any other contaminated material.
- Methods to be used to remove the above from the site.
- Test methods to be used to assure that all contaminated materials have been removed (i.e., in situ soil is not hazardous).

6.9 REFERENCES

1. U.S. Environmental Protection Agency. Permit Applicants' Guidance Manual for General Facility Standards. Washington, D.C., 1984 (being drafted).

2. U.S. Environmental Protection Agency. Test Methods for the Evaluation of Solid Waste, Physical/Chemical Properties. SW-846, Washington, D.C., 1982. GPO Stock No. 055-002-81001-2.

3. U.S. Environmental Protection Agency. Draft RCRA Guidance Document, Waste Pile Design, Liner Systems. Washington, D.C., 1982.

4. U.S. Environmental Protection Agency. Draft RCRA Guidance Document, Landfill Design, Liner Systems and Final Cover. Washington, D.C., 1980.

5. U.S. Environmental Protection Agency. Lining of Waste Impoundments and Disposal Facilities. SW-870, Washington, D.C., March 1983. GPO Stock No. 055-000-00231-2.

6. U.S. Environmental Protection Agency. Landfill and Surface Impoundment Performance Evaluation. SW-869, September 1980. GPO Stock No. 055-000-00233-9.

7. U.S. Soil Conservation Service. National Engineering Handbook 5: Hydraulics. Washington, D.C., 1977. NTIS No. PB243-644.

8. U.S. Environmental Protection Agency. Evaluating Cover Systems for Solid and Hazardous Waste. SW-867, Washington, D.C., September 1982. GPO Stock No. 055-000-00228-2.

9. Hatayama, H.K., J. J. Chen, E.R. deVera, R.D. Stephens, and D.L. Storm. A Method for Determining the Compatability of Hazardous Wastes. EPA-600/2-80-076. California Department of Health Services, Berkely, CA, April 1980. NTIS No. PB80-H21005.

10. Hatayama, H.K., R.D. Stephens, E.R. deVera, J.J. Chen, and D.L. Storm. Hazardous WAste Compatibility. In: Disposal of Hazardous Waste; Proceedings of the Sixth Annual Research Symposium, Chicago, March 1980. EPA-600/9-80-010, March Municipal Environmental Research Laboratory, Cincinnati, OH, March 1980. NTIS No. PB80-175086. pp 21-30.

11. U.S. Environmental Protection Agency. Draft Solid Waste Leaching Procedure Manual. Washington, D.C., 1983.

12. U.S. Environmental Protection Agency. User Guide for the Hydrogeologic Evaluation of Landfill Performance (HELP) Model. Washington, D.C. (to be released in 1984).

6.10 CHECKLIST

Table 6-1 is a checklist of permit application requirements for waste piles. Waste piles are subdivided to identify new versus existing units and the varying requirements depending on liner configuration.

The applicant is encouraged to use the checklist and to incorporate it into the permit application. The checklist identifies the application requirements and provides references to Parts 264 and 270. The applicant should identify the location in the application of the material addressing each requirement and state this in the space provided. This will help ensure that the application is complete. As noted in Section 4.0, it is suggested that a copy of this checklist be included as part of the permit application. It will aid the reviewers of the application. Reviewers will be able to more readily locate specific aspects of the application, thus facilitating communication between reviewers and applicants.

Definitions of terms used in the checklist are provided below. Footnotes included in the checklist are explained on the last page of the checklist.

Existing: A waste pile that was in operation or for which construction had commenced on or before issuance of Part B permit *and* which has or will receive hazardous wastes after January 26, 1983.

New, Type 1: Single liner, non-inspectable. Ground-water monitoring required (g-w).

New, Type 2: Single liner, inspectable. No ground-water monitoring.

New, Type 3: Double synthetic liner, leachate collection, leak detection, and above-ground water. Ground-water monitoring not required.

New, Type 4: Enclosed dry waste pile. Exempt from liner and ground-water monitoring requirements.

New, Type 5: Exempt from liner requirement. Ground-water monitoring probably not required.

An "X" in the checklist indicates that the applicant for that type of unit must address the specific item or an equivalent optional item (if available) in the permit application.

An "O" in the checklist indicates that the item is optional in the permit application. Response to an optional item may eliminate the necessity of responding to certain items that might otherwise be required.

An "e" in the checklist indicates that the item does *not* apply to "existing portions" of existing units, but *does* apply to new portions of existing units.

A blank space in the checklist means that either the subject requirement is general and serves as a heading for subordinates listed below it, or that the subject requirement does not apply to that type of management unit.

TABLE 6-1

PERMIT APPLICATION CHECKLIST FOR WASTE PILES

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
270.14(b)		Part B General Information Requirements*								
270.14(b)(1)		- General description of the facility	X	X	X	X	X	X		
270.14(b)(2)	264.13(a)	- Chemical and physical analysis of hazardous wastes to be handled	X	X	X	X	X	X		
270.14(b)(3)		- Waste analysis plan								
	264.13(b)(1) through (5)	- Analysis parameters with rationale	X	X	X	X	X	X		
		- Test methods for analyzing parameters	X	X	X	X	X	X		
		- Procedure for collecting representative samples	X	X	X	X	X	X		
		- Frequency of analyses	X	X	X	X	X	X		
		- List and description of waste analyses to be generator supplied	X	X	X	X	X	X		
	264.13(b)(6) and 264.17(c)	- Waste analysis procedures for ignitable, reactive, incompatible wastes	X	X	X	X	X	X		
	264.13(c)	- For off-site facilities, procedures to identify each waste movement, and	X	X	X	X	X	X		
		- Procedures for collecting representative samples	X	X	X	X	X	X		
270.14(b)(4)		- Security description for active portion of facility								
	264.14(a)	- Security procedures waiver justification	0	0	0	0	0	0		

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WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, Inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Unknowing/unauthorized contact with waste not harmful	0	0	0	0	0	0		
		- Unknowing/unauthorized disturbance of waste or equipment cannot cause violation of Part 264	0	0	0	0	0	0		
	264.14(b)	- Description of 24-hour surveillance system, or	X	X	X	X	X	X		
		- Description of artificial or natural barriers, and	X	X	X	X	X	X		
		- Description of controlled entry/egress procedures, and	X	X	X	X	X	X		
	264.14(c)	- Description of warning signs	X	X	X	X	X	X		
		- List of languages on signs	X	X	X	X	X	X		
		- Statement of 25-foot legibility	X	X	X	X	X	X		
		- Description of sign locations and numbers of signs	X	X	X	X	X	X		
270.14(b)(5)		- General Inspection Schedule and Procedures Description	X	X	X	X	X	X		
	264.15(b)(1)	- Written schedule	X	X	X	X	X	X		
	264.15(b)(2) and 265.15(d)	- Statement as to where, at facility, inspection schedule and inspection records will be kept	X	X	X	X	X	X		

WASTE PILES (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
	264.15(b)(1)	- Identification of equipment/processes to be inspected	X	X	X	X	X	X		
	264.15(b)(3)	- Identification of types of problems each equipment/process to be checked for	X	X	X	X	X	X		
	264.15(b)(4)	- Frequency of inspections by equipment/process	X	X	X	X	X	X		
	264.15(c)	- Schedule of remedial action	X	X	X	X	X	X		
270.14(b)(5) and 270.18(e)	264.15(a) and 264.254	- Specific Inspection Requirements for Waste Piles, description of procedures for								
		- Inspection of liners/covers during and immediately after installation	e	X	X	X				
		- Inspections weekly and after storms for	X	X	X	X	X	X		
		- Operation of run-on/run-off controls	X	X	X	X	X	X		
		- Liquids in leak detection system				X				
		- Proper functioning of wind dispersal controls	X	X	X	X	X			
		- Leachate in and proper operation of leachate collection/removal system	e	X	X	X				
270.14(b)(6)	Part 264 Subpart C	- Preparedness and Prevention Documentation								
		- Waiver(s) request and justification	0	0	0	0	0	0		

WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
	264.32(a)	- Description of internal communications/alarm system(s)	X	X	X	X	X	X		
	264.34(a)	- Documentation of personnel access to internal communication/alarm system(s)	X	X	X	X	X	X		
	264.32(b)	- Description of external communications/alarm system(s)	X	X	X	X	X	X		
	264.34(b)	- Documentation of personnel access to external communications/alarm system(s)	X	X	X	X	X	X		
	264.32(c)	- Description of fire control/extinguishing, spill control, and decontamination equipment	X	X	X	X	X	X		
	264.32(d)	- Documentation of adequate water volume and pressure for above equipment	X	X	X	X	X	X		
	264.33	- Documentation of equipment testing/maintenance schedule and procedures	X	X	X	X	X	X		
	264.35	- Documentation of adequate aisle space	X	X	X	X	X	X		
	264.37 (also 264.52(c))	- Documentation and descriptions of arrangements or attempts at arrangements with:	X	X	X	X	X	X		
		- Police department(s)	X	X	X	X	X	X		
		- Fire department(s)	X	X	X	X	X	X		
		- Hospitals	X	X	X	X	X	X		
		- Local emergency response teams	X	X	X	X	X	X		

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WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- State emergency response teams	X	X	X	X	X	X		
		- Emergency response contractors	X	X	X	X	X	X		
		- Equipment suppliers	X	X	X	X	X	X		
	264.37(a)(2)	- Documentation of agreements designating primary emergency authority	X	X	X	X	X	X		
270.14(b)(7)	Part 264 Subpart D	- Contingency Plan Documentation								
	264.51 and 264.52(a)	- Criteria for implementation of contingency plan	X	X	X	X	X	X		
	264.52(d)	- Emergency Coordinators Identification								
		- Names	X	X	X	X	X	X		
		- Addresses	X	X	X	X	X	X		
		- Home/Work Phones	X	X	X	X	X	X		
	264.55	- Documentation of Qualifications	X	X	X	X	X	X		
		- Documentation of Authority	X	X	X	X	X	X		
		- Description of notification procedure	X	X	X	X	X	X		
	264.52(e)	- Emergency equipment list								
		- Documentation of equipment location	X	X	X	X	X	X		

WASTE PILES (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Physical description of equipment	X	X	X	X	X	X		
		- Statement of equipment capabilities	X	X	X	X	X	X		
	264.52(f)	- Evacuation Plan								
		- Criteria for implementation	X	X	X	X	X	X		
		- Description of signal(s) to implement	X	X	X	X	X	X		
		- Description of primary and alternate routes	X	X	X	X	X	X		
	264.53	- Contingency Plan Copy Location								
		- Description of location of facility's copy of plan	X	X	X	X	X	X		
		- Number of duplicate copies distributed and their location	X	X	X	X	X	X		
	264.54	- Contingency Plan Amendment								
		- Identification of person responsible and authorized to change/amend plan	X	X	X	X	X	X		
		- Description of procedure to change/amend facility copy of plan	X	X	X	X	X	X		
		- Description of procedure to insure update of all copies of plan	X	X	X	X	X	X		

WASTE PILES (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
	264.56	- Detailed Emergency Procedures								
		- Procedure for facility personnel notification	X	X	X	X	X	X		
		- Procedure for state/local agency notification	X	X	X	X	X	X		
		- Procedure for identification of character, source, amount, and areal extent of released materials	X	X	X	X	X	X		
		- Procedure for assessment of environment/human health hazards	X	X	X	X	X	X		
		- Identification of On-Scene Coordinator for geographic area	X	X	X	X	X	X		
		- Description of specific responses and control procedures for								
		- Fire	X	X	X	X	X	X		
		- Explosion	X	X	X	X	X	X		
		- Spill	X	X	X	X	X	X		
		- Description of process shutdown and monitoring procedures	X	X	X	X	X	X		
		- Description of cleanup procedures and associated material treating, storing, disposal procedures	X	X	X	X	X	X		

WASTE PILES (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Description of emergency equipment cleaning and refitting procedures	X	X	X	X	X	X		
		- Description of procedures to insure incompatible waste segregation during cleanup	X	X	X	X	X	X		
	[Note:	There are no §270 requirements which parallel Part 264, Subpart E. However, the applicant should be familiar with the following sections of the regulations since the requirements in them will be enforceable under any permit received. Part 264, Subpart E, §264.70 through §264.77 Part 270.30, Subpart C The applicant should be prepared to respond to inquiries by the permit application reviewers regarding these requirements.]								
270.14(b)(8)		- Preventive Procedures, Structures, and Equipment Documentation, including description of equipment/procedures to								
		- Prevent hazards during unloading operations	X	X	X	X	X	X		
		- Prevent water supply contamination	X	X	X	X	X	X		
		- Mitigate equipment failure and power outages	X	X	X	X	X	X		
		- Prevent undue personnel exposure to wastes	X	X	X	X	X	X		
270.14(b)(9)	264.17	- Prevention of Accidental Ignition or Reaction Documentation								
		- Description of separation and protection of ignitable, reactive, incompatible wastes	X	X	X	X	X	X		

WASTE PILES (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Description of ignitable, reactive, incompatible wastes handling procedures	X	X	X	X	X	X		
		- Description of number, location, and type of warning/prohibition signs	X	X	X	X	X	X		
		- Documentation that procedures are adequate to prevent accidental ignitions or reactions	X	X	X	X	X	X		
270.14(b)(9) and 270.18(g) and 270.18(h)	264.17(b)	- Specific Ignitable/Reactive Waste Requirements for Waste Piles if I/R waste stored.								
	264.256	- Procedures that render waste nonreactive or nonignitable, or	X	X	X	X	X	X		
		- Procedures for preventing reactions, and	0	0	0	0	0	0		
		- Procedures for protecting wastes	0	0	0	0	0	0		
	264.257	- Incompatible waste segregation or protection procedures	X	X	X	X	X	X		
270.14(b)(10)		- Traffic Documentation, identification of:								
		- Waste movement routes	X	X	X	X	X	X		
		- Number of movements by type vehicle	X	X	X	X	X	X		
		- Quantity of waste moved per movement per vehicle	X	X	X	X	X	X		
		- Traffic control signals and personnel	X	X	X	X	X	X		

WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Route surface composition and load bearing capacity	X	X	X	X	X	X		
270.14(b)(11)		- Facility Location Documentation *								
270.14(b)(11)(i) and (ii)		- Political jurisdiction identified (new facilities only)		X	X	X	X	X		
		- Comparison to Appendix VI of Part 264	X	X	X	X	X	X		
		- Demonstration that faults with displacement in Holocene time are more than 3,000 feet from facility (western states)	X	X	X	X	X	X		
	264.18(a)	- If Holocene-time faults are within 3,000 feet, demonstration that no faults pass within 200 feet of unit sites (western states)	X	X	X	X	X	X		
270.14(b)(11), (iii) through (v)	264.18(b)	- Documentation of facility location relative to 100-year flood plain level or wave action flooding	X	X	X	X	X	X		
		- If unit in flood plain, documentation that facility can withstand the 100-year flood without washout by:	X	X	X	X	X	X		
		- Analysis of hydrodynamic/hydrostatic forces resulting at site from 100-year flood, and	X	X	X	X	X	X		
		- Presentation of operating units and flood protection devices design and how they will prevent washout, or	X	X	X	X	X	X		

WASTE PILES (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Plan for removal of waste before washout including,	0	0	0	0	0	0		
		- Timing of removal relative to flood levels	0	0	0	0	0	0		
		- Estimated time to remove all waste	0	0	0	0	0	0		
		- Location to which waste will be moved and proof of compliance with Parts 270 and 264 through 267 of this Chapter	0	0	0	0	0	0		
		- Detailed description of personnel, equipment, and procedures for waste removal sufficient to insure availability in time for use	0	0	0	0	0	0		
		- Analysis of potential for discharge during waste movement	0	0	0	0	0	0		
		- A plan documenting how and on what time schedule the facility will comply with §264.18(b) if not in compliance (existing facilities only)	X							
270.14(b)(12)	264.16	- Personnel Training Program Documentation								
		- Outline of introductory and continuing personnel training programs	X	X	X	X	X	X		
		- Identification and qualifications of program instructor	X	X	X	X	X	X		

WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Brief description of how training program meets actual job tasks	X	X	X	X	X	X		
		- Description of procedures to insure all appropriate personnel receive appropriate training and receive annual training review	X	X	X	X	X	X		
		- Description of records to be kept, their location, and procedures to insure they are retained for proper length of time	X	X	X	X	X	X		
270.14(b)(13)	264.112	- Closure Plan Documentation								
		- Description of partial and final closure procedures	X	X	X	X	X	X		
		- Description of maximum unclosed portion during facility life	X	X	X	X	X	X		
		- Estimate of maximum waste inventory in storage/treatment during facility life	X	X	X	X	X	X		
	264.114	- Equipment decontamination procedure	X	X	X	X	X	X		
		- Estimated year of closure	X	X	X	X	X	X		
	254.113	- Description of closure schedule including	X	X	X	X	X	X		
		- Total time to close	X	X	X	X	X	X		
270.14(b)(13)	254.113	- Trackable intervening closure activities	X	X	X	X	X	X		

WASTE PILES (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Location(s) and number of copies of closure plan	X	X	X	X	X	X		
		- Identification of person responsible for storage and updating of facility copy of closure plan	X	X	X	X	X	X		
		- Procedure for updating all other copies of closure plan	X	X	X	X	X	X		
270.14(b)(13) and 270.18(i)	264.112	- Specific Closure Plan Requirements for Waste Piles								
	264.258(a)	- Procedure for removal and/or decontamination of all wastes and materials/equipment associated with the waste pile	X	X	X	X	X	X		
	264.258(b)	- Procedure for closing in conformance with landfill closing requirements[1]	X							
270.14(b)(13)	264.117 and 264.118	- Post-Closure Plan Documentation[1]								
		- Description of ground-water monitoring activities and frequencies	X							
		- Description of maintenance activities and frequencies for:	X							
		- Final containment structures	X							
		- Facility monitoring equipment	X							

WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Location(s) and number of copies of post-closure plan	X							
		- Identification and location (address and phone number) of person responsible for storage and updating of facility copy of post-closure plan prior to closure	X							
		- Identification and location (address and phone number) of person responsible for storage and updating facility copy of post-closure plan during post-closure period	X							
		- Procedure for updating all other copies of post-closure plan	X							
270.14(b)(13) and 270.18(i)	264.118 and 264.258(b)	- Specific Post-Closure Plan Requirements for[1] Waste Piles								
		- Procedures for post-closure care that meet the requirements for landfills	X							
270.14(b)(14)	264.120	- Documentation of Notice on Deed (existing facilities only)	X							
		- Statement that land used to manage wastes	X							
		- Statement of restricted use per §284.117(c)	X							
270.14(b)(15)	264.142	- Closure Cost Estimate								
	264.143 and 264.146	- Documentation of a financial assurance mechanism for closure that is one of the following:	X	X	X	X	X	X		

WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
	264.151(a)	- Closure trust fund	0	0	0	0	0	0		
	264.151(b)	- Surety bond guaranteeing payment	0	0	0	0	0	0		
	264.151(c)	- Surety bond guaranteeing performance	0	0	0	0	0	0		
	264.151(d)	- Closure letter of credit	0	0	0	0	0	0		
	264.151(e)	- Closure insurance	0	0	0	0	0	0		
	264.15(f) and (h)	- Financial test and corporate guarantee	0	0	0	0	0	0		
		- Multiple financial mechanism for one facility	0	0	0	0	0	0		
		- Single financial mechanism for multiple facilities	0	0	0	0	0	0		
270.14(b)(16)	264.144	- Post-Closure Cost Estimate[1]								
	264.145 and 264.146	- Documentation of a financial assurance mechanism for post-closure that is one of the following:	X							
	264.151(a)	- Closure trust fund	0							
	264.151(b)	- Surety bond guaranteeing payment	0							
	264.151(c)	- Surety bond guaranteeing performance	0							
	264.151(d)	- Post-closure letter of credit	0							
	264.151(e)	- Post-closure insurance	0							

WASTE PILES (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
	264.151(f) and (h)	- Financial test and corporate guarantee	0							
		- Multiple financial mechanism for one facility	0							
		- Single financial mechanism for multiple facilities	0							
270.14(b)(17)	264.147	- Documentation of Insurance	X	X	X	X	X	X		
		- Request for variance from insurance	0	0	0	0	0	0		
	264.151(i) and (j)	- Insurance for sudden/accidental occurrences	X	X	X	X	X	X		
		- Insurance for nonsudden/accidental occurrences	X	X	X	X	X	X		
	264.151(g)	- Financial test for liability coverage	0	0	0	0	0	0		
270.14(b)(18)	264.149	- Documentation of a State Required Financial[2] Mechanism for Closure, Post-Closure, or Liability including	0	0	0	0	0	0		
		- EPA I.D. number	0	0	0	0	0	0		
		- Facility name	0	0	0	0	0	0		
		- Facility address	0	0	0	0	0	0		
		- Amounts of liability coverage or funds assured	0	0	0	0	0	0		
	264.150	- Documentation of State Assumed Responsibility[2] for Closure Post-Closure or Liability including	0	0	0	0	0	0		

WASTE PILES (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Letter from State describing State's responsibilities	0	0	0	0	0	0		
		- Facility EPA I.D. number	0	0	0	0	0	0		
		- Facility name	0	0	0	0	0	0		
		- Facility address	0	0	0	0	0	0		
		- Amounts of liability coverage or funds assured	0	0	0	0	0	0		
270.14(b)(19)		- Topographic map showing a distance of 1,000 feet around facility at a scale of not more than 1 inch equals 200 feet that clearly shows	X	X	X	X	X	X		
		- Contours	X	X	X	X	X	X		
		- Proper contour intervals	X	X	X	X	X	X		
		- Map scale and date	X	X	X	X	X	X		
		- 100-year flood plain area	X	X	X	X	X	X		
		- Surface waters and intermittent streams	X	X	X	X	X	X		
		- Surrounding land uses	X	X	X	X	X	X		
270.14(b)(19)		- Wind rose	X	X	X	X	X	X		
		- North orientation	X	X	X	X	X	X		
		- Legal boundaries of facility site	X	X	X	X	X	X		

WASTE PILES (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Access control	X	X	X	X	X	X		
		- Injection and withdrawal wells onsite and offsite	X	X	X	X	X	X		
		- Buildings and recreation areas	X	X	X	X	X	X		
		- Run-off control systems	X	X	X	X	X	X		
		- Access and internal roads	X	X	X	X	X	X		
		- Storm, sanitary, and process sewerage systems	X	X	X	X	X	X		
		- Loading and unloading areas	X	X	X	X	X	X		
		- Fire control facilities	X	X	X	X	X	X		
		- Barriers for drainage or flood control	X	X	X	X	X	X		
		- Location of past or present operational units and equipment cleanup areas	X	X	X	X	X	X		
270.17, 270.18, 270.20 and 270.21		Part B Specific Information Requirements								
270.18		- Specific Requirements for Waste Piles								
270.18(a)		- List of hazardous wastes placed or to be placed in each waste pile	X	X	X	X	X	X		
270.18(b)	264.250(c)	- Documentation of general exemption from §264.251 and Part 264, Subpart F, including					X			
		- Waste pile protection from precipitation					X			

WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Procedures for insuring liquids are not placed in pile					X			
		- Description of run-on controls					X			
		- Description of wind dispersal controls other than wetting					X			
		- Decomposition/reactions do not cause leachate generation					X			
270.18(c)	264.251(a)	- Detailed plans and an engineering report describing	e	X	X	X				
270.18(c)(1)	264.251(a)(1)	- Liner system construction (new only)	e	X	X	X				
		- Material of construction	e	X	X	X				
		- Chemical properties	e	X	X	X				
		- Physical strength	e	X	X	X				
		- Thickness	e	X	X	X				
		- Foundation design/integrity	e	X	X	X				
		- Area covered	e	X	X	X				
		- Liner system integrity against (new only)	e	X	X	X				
		- Internal and external pressure gradients	e	X	X	X				

WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Contact with waste/leachate	e	X	X	X				
		- Climatic conditions	e	X	X	X				
		- Installation stresses	e	X	X	X				
		- Daily operational stresses	e	X	X	X				
	264.251(a)(2)	- Leachate collection and removal system to maintain less than one foot of leachate on liner including	e	X	X	X				
		- Materials of construction	e	X	X	X				
		- Chemical resistance to waste/leachate	e	X	X	X				
		- Strength sufficient to prevent collapse	e	X	X	X				
		- Provisions to prevent clogging	e	X	X	X				
	264.251(b)	- Liner system/leachate system exemption including						X		
		- Nature and quantity of wastes						X		
		- Alternative design and operation						X		
		- Pile location description						X		
		- Hydrogeologic setting						X		
		- Attenuative capacity of materials between pile, ground and surface waters						X		

WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Documentation of no migration to ground/ surface waters at any future time						X		
270.18(c)(2)	264.251(c)	- System for control of run-on from peak discharge of a 25-year storm	X	X	X	X	X	X		
270.18(c)(3)	264.251(d)	- System for control of run-off water volume of a 24-hour, 25-year storm	X	X	X	X	X	X		
270.18(c)(4)	264.251(e)	- Procedures to manage collection and holding facilities associated with run-on and run-off control systems	X	X	X	X	X	X		
270.18(c)(5)	264.251(f)	- Wind dispersal control procedures	X	X	X	X	X	X		
270.18(d)	264.252(a)	- Documentation for Part 264, Subpart F exemption including				X				
		- Pile and liners above seasonal high water table				X				
		- Two liners meeting requirements of §264.251(a)(1)				X				
		- Leak detection system between liners				X				
		- Leachate system meeting §264.251(a)(2) requirements				X				
	264.253(a)	- Documentation for Part 264, Subpart F exemption including			X					

WASTE PILES (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Pile and liners above seasonal high water table			X					
		- Liner meets §264.251(a)(1) requirements			X					
		- Soil characteristics/depths			X					
		- Leachate system meets §264.251(a)(2) requirements			X					
		- Schedule/procedures for liner inspection by waste removal			X					
		- Sufficient liner strength/thickness to allow periodic removal/replacement of wastes			X					
270.18(f)		- Description of treatment carried out in or on the pile including	X	X	X	X	X	X		
		- Details of treatment process	X	X	X	X	X	X		
		- Equipment used	X	X	X	X	X	X		
		- Nature and quality of residuals	X	X	X	X	X	X		
270.14(c)	Part 264 Subpart F	Part B Protection of Ground-Water Information[3] Requirements for Waste Piles								
270.14(c)(1)		- Interim status period ground-water monitoring[4] data summary								

WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
270.14(c)(2)		- Identification of uppermost and hydraulically interconnected aquifers under facility including	X	X				X		
		- Water flow rate and direction	X	X				X		
		- Bases for identification	X	X				X		
270.14(c)(3) and 270.14(b)(19)		- Topographic map	X	X				X		
		- Delineation of property boundary	X	X				X		
	264.95(b)	- Delineation of waste management area	X	X				X		
	264.95(a)	- Delineation of proposed point of compliance	X	X				X		
		- Ground-water monitoring well locations	X	X				X		
		- Location of aquifers	X	X				X		
270.14(c)(4)(i) through (ii)		- Descriptions of existing contamination	X							
		- Delineation of plume extent	X							
		- Appendix VIII constituents concentrations	X							
		- Concentrations throughout plume	X							
		- Maximum concentration in plume	X							
270.14(c)(5)	264.97	- Detailed plans and an engineering report of Ground-Water Monitoring Program	X	X				X		
	264.97(a)	- Description of wells	X	X				X		

WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- Number of wells	X	X				X		
		- Locations	X	X				X		
		- Depths	X	X				X		
		- Assurance of unaffected background water measurement	X	X				X		
		- Assurance of compliance point ground-water measurement	X	X				X		
	264.97(c)	- Casing description	X	X				X		
	264.97(d)	- Description of sampling/analysis procedures	X	X				X		
		- Sample collection methods	X	X				X		
		- Sample preservation/shipment	X	X				X		
		- Analytical procedures	X	X				X		
		- Chain of custody control	X	X				X		
	264.97(e)	- Documentation of proper/adequate analytical procedures	X	X				X		
	264.97(f)	- Procedure for determination of ground-water elevation with each sample	X	X				X		
270.14(c)(6)	264.91(a)(4) and 264.98	- Description of Detection Monitoring Program[3,5] including								

WASTE PILES (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
270.14(c)(6)(i)	264.93 and 264.98(a)	- List of indicator parameters, waste constituents, reaction products* to be monitored for, including	X	X				X		
		- Type, quantities, concentrations expected in wastes	X	X				X		
		- Mobility, stability, persistence in unsaturated zone	X	X				X		
		- Detectability in ground-water	X	X				X		
270.14(c)(6)(ii) and (iii)	264.98(a)(4) and 26498(c)(1)	- Background ground-water concentration values and coefficients of variation established by one of the following:	X	X				X		
	264.98(c)(3)	- Use of an appropriate ground-water monitoring system, and	0	0				0		
	264.97(g)(1)	- Quarterly sampling of upgradient wells for one year, or	0	0				0		
	264.97(g)(3)	- Quarterly sampling of other wells for one year, and	0	0				0		
	264.97(g)(4)	- Data from a minimum of one sample/well and minimum of four samples per quarter, or	0	0				0		
		- Presentation of procedures to calculate such values	0	0				0		

WASTE PILES (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
270.14(c)(6)(ii)	264.98(b)	- Description of an appropriate ground-water monitoring system to be installed at the compliance point	X	X				X		
270.14(c)(6)(iv)	264.98(d)	- Procedures for collecting semi-annual ground-water samples at the compliance point during	X	X				X		
		- Active life	X	X				X		
		- Closure period	X	X				X		
		- Post-closure period[1]	X							
	264.98(e)	- Procedure for annual determination of uppermost aquifer flow rate and direction	X	X				X		
	264.98(f) and 264.97(d) and (e)	- Documentation of sample collection and analysis procedures	X	X				X		
	264.98(g)	- Procedure for determining a statistically significant increase for any monitored parameter or constituent by	X	X				X		
		- Comparing compliance point data to background value data using the procedures in §264.97(h)(1) or (2), and	X	X				X		
		- Providing an estimate of the time period after sampling completion necessary to obtain results	X	X				X		

WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
	264.98(h)	- Procedure to be implemented if a statistically significant increase in any constituent or parameter is identified at any compliance point monitoring well, including	X	X				X		
	264.98(h)(1)	- Written notification to Regional Administrator	X	X				X		
	264.98(h)(2)	- Sample collection and analysis methods for all Appendix VIII constituents at all monitoring wells	X	X				X		
	264.98(h)(3)	- Method for establishing Appendix VIII constituent background values	X	X				X		
	264.98(h)(4)	- Preparation of an application for permit modification to establish compliance monitoring	X	X				X		
270.14(c)(7)	264.91(a)(1) and 264.99	- Description of Compliance Monitoring Program[7], including	0	0				0		
		- List of wastes previously handled at facility	0							
		- Characterization of contaminated ground-water[8]	0							
		- Hazardous constituents identified	0							
		- Hazardous constituents concentrations	0							
	264.99(b)	- Description of compliance monitoring system at the compliance point	0	0				0		

WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- List of hazardous constituents to be compliance monitored	0	0				0		
	264.96	- Proposed compliance period	0							
	264.99(d)	- Procedure for collecting quarterly samples at compliance point during compliance period	0	0				0		
	264.99(c)(3)	- Procedures for establishing background concentration values for constituents that are based on one of the following:	0	0				0		
		- Use of an appropriate ground-water monitoring system, and	0	0				0		
	264.97(g)	- Data that is available prior to permit issuance	0	0				0		
		- Data that accounts for measurement errors in sampling and analysis	0	0				0		
		- Data that accounts for seasonal ground-water quality fluctuations	0	0				0		
		- Data from a minimum of one sample per well and a minimum of four samples from monitoring system, each time system is sampled	0	0				0		
270.14(c)(7)(iv)	264.92 and 264.99(c)(1), (2)	- Proposed concentration limits for constituents with justification based on	0	0				0		
		- §264.94(a)(1) and §264.97(g)	0	0				0		

WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
		- §264.94(a)(2)	0	0				0		
		- §264.94(b) and §264.99(c)(1)*	0	0				0		
	264.99(e)	- Procedure for annual determination of uppermost aquifer flow rate and direction	0	0				0		
	264.99(f)	- Procedures for annual testing of all compliance point wells for Appendix VIII constituents	0	0				0		
	264.99(g)	- Documentation of all sampling and analysis procedures	0	0				0		
	264.99(h)	- Procedures for determining a statistically significant increase for any monitored constituent by	0	0				0		
		- Comparing compliance point data to the concentration limit using the procedure in §264.97(h)(2)	0	0				0		
		- Providing an estimate of the time period after sampling completion necessary to obtain results	0	0				0		
	264.99(i)	- Procedures to be implemented if the ground-water protection standard is exceeded at any compliance point monitoring well, including	0	0				0		
	264.99(i)(1)	- Written notification to Regional Administrator	0	0				0		

WASTE PILES (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
	264.99(i)(2)	- Preparation of an application for permit modification to establish a corrective action program, including	0	0				0		
		- Details of program to comply with ground-water protection standard	0	0				0		
270.14(c)(7)(v)	264.99(i)(2)(ii)	- Details of ground-water monitoring to demonstrate effectiveness of program	0	0				0		
270.14(c)(8)	264.91(a)(2) and 264.100	- Description of Corrective Action Program[9], including	0	0				0		
270.14(c)(8)(i)		- Characterization of contaminated ground-water	0							
	264.100(a)(1)	- Identified hazardous constituents	0							
		- Concentrations of hazardous constituents	0							
270.14(c)(8)(ii)	264.100(a)(2)	- Concentration limit for each hazardous constituent	0	0				0		
270.14(c)(8)(iii)	264.100(b)	- Detailed plan and an engineering report describing the corrective actions to be taken at the compliance point	0	0				0		
	264.100(c)	- Time period necessary to implement corrective action program	0	0				0		
270.14(c)(8)(iv)	264.100(d)	- Description of ground-water monitoring program that will be sufficient to assess the adequacy of corrective action	0	0				0		

WASTE PILES (Concluded)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 1 liner, inpsect	New, Type 3, 2 liners	New, Type 4, 0 liners, enclosed	New, Type 5, 0 liners	Location in Application	Comments
	264.91(a)(3) and 264.100(e)	- Description of the corrective action to be taken for constituents in ground-water between compliance point and downgradient facility boundary	0	0				0		
	264.100(g)	- Procedure and content for semi-annually submitting written reports to the Regional Administrator on program effectiveness	0	0				0		
		Part B Certification and Signatories								
270.11(d)		- Certification paragraph	X	X	X	X	X	X		
270.11(a)		- Appropriate signatory	X	X	X	X	X	X		

FOOTNOTES FOR WASTE PILES

[1] Notwithstanding the fact that the applicant intends to remove all hazardous materials at closure, an existing waste pile that does not have a liner meeting the Part 264 liner requirements and has not received a variance will be required to present plans to close the facility as a landfill in the event that all hazardous waste cannot be removed at closure. Such units are also required to have contingent post-closure plans and financial plans similar to those for landfills.

[2] State-specific. Contact State or Regional EPA representatives to discuss requirements.

[3] New, Type 5 units are not automatically exempt from ground-water protection standards of Subpart F. Applicants are subject to indicated requirements unless a Section 264.90(b)(4) waiver has been granted.

[4] If data are available, they should be included.

[5] Applies to new facilities, and existing facilities at which contamination has not been detected.

[6] New facilities and existing facilities containing only waste piles must present procedures for determining these background values or the values themselves. In addition, depending on their condition, existing waste piles may be required to collect ground-water quality data prior to submission of a Part B permit application.

[7] Required of existing facilities where ground-water monitoring data indicate the presence of hazardous constituents. Under some circumstances, new, Type 1 or Type 5 units and existing units without contamination may have certain portions of a Compliance Monitoring Program in the permit on "stand-by."

[8] Applicable to existing facilities with indications of hazardous constituents in the ground water.

[9] Applicability to existing facilities will be case-by-case, based on monitoring data indicating ground-water contamination. Under some circumstances, new, Type 1 or Type 5 units and existing units without contamination may have a Corrective Action Plan included in permit on "standby."

SECTION 7.0

LAND TREATMENT UNIT PERMIT APPLICATION GUIDANCE

7.1 SCOPE AND FORMAT

This section contains information and guidance applicable to Part B permit applications for hazardous waste land treatment units, which are waste management units at which hazardous wastes are applied onto or incorporated into the soil surface. The primary objective of land treatment unit operations must be to degrade, transform or immobilize hazardous constituents in the waste. The Part 264 and Part 270 regulations for land treatment units include requirements in the following major subject areas: treatment demonstration, land treatment program, design and operating requirements, food chain crops, unsaturated monitoring closure and post closure care, ignitable and reactive wastes, and incompatible wastes.

Each major subject in this section is divided into the following three parts: (1) Federal requirement, (2) guidance on achieving the Part 264 standard, and (3) guidance in addressing the application information requirements. The first part defines the specific information requirement contained in Part 270, as well as the corresponding technical standard contained in Part 264. The second part provides references and general guidance on how the Part 264 standard can be met, while the third part provides the permit applicant with detailed guidance on what information should be included in the permit application to adequately address the Part 270 requirement.

This section contains specific information items to be included in Part B of the permit application for hazardous waste land treatment units. These items should be included along with the general facility information and the groundwater protection information. Do not omit any item or part of any item without providing a clear explanation of why the item was omitted.

7.2 SPECIAL PERMITTING PROCEDURES

Because all land treatment units are required to complete a treatment demonstration prior to obtaining a full-scale permit, special permitting procedures are provided. The regulations allow the applicant to use, among other means, field or laboratory tests to make the treatment demonstration. However, field and laboratory tests can only be performed under a permit because they involve the treatment and disposal of hazardous waste. The special land treatment permitting procedures provide the applicant with various approaches for obtaining a permit to conduct these field or laboratory tests, which will be necessary in many cases to successfully complete the treatment demonstration. Three types of permits pertain to land treatment units:

- Short-term treatment demonstration permit;
- Full-scale facility permit; and
- Two-phase permit.

Section 270.63 defines the nature of the short-term and two-phase permits. A reprint of this section is provided in Section 7.3 of this Manual. Table 7-1 outlines the essential aspects of these permits.

TABLE 7-1. LAND TREATMENT PERMITS

Short-Term Treatment Demonstration Permit

- Small-scale lab or field experiment to demonstrate that hazardous constituents in waste can be treated in the proposed land treatment unit.
- Used when insufficient "treatment" information exists to satisfy treatment demonstration requirement or to establish preliminary permit conditions for full-scale facility permits.
- Permit must contain only provisions necessary to meet the general performance standards in §264.272(c).
- Public comment and hearing required.

Full-Scale Facility Permit

- Used when complete data have been collected to satisfy the treatment demonstration requirement (i.e., using available literature data, operating data, or lab or field test results).
- Permit must contain provisions necessary to meet all the Subpart M, Part 264 requirements and all other applicable Part 264 standards.
- Public comment and hearing required.

Two-Phase Permit

- Combination of above two permits:
    - Phase 1: Treatment demonstration.
    - Phase 2: Full-scale facility design and operation.
- Used when substantial, but incomplete, "treatment" data exists. Sufficient data are not available to completely satisfy treatment demonstration, but sufficient data are available to determine the preliminary set of full-scale facility permit conditions.
- Phase 1 and 2 permits written based on substantial but incomplete information; Phase 2 permit modified to incorporate results of Phase 1.
- Avoids the burden of two separate permitting procedures (e.g., only one public comment and hearing is necessary rather than two).
- Phase 1 permit contains provisions necessary to meet treatment demonstration; Phase 2 contains provisions to meet

requirements and all other applicable Part 264 standards.

A short-term treatment demonstration permit authorizes small-scale laboratory or field tests. This permit contains only provisions necessary to meet the general performance standards in §264.272(c). The applicant only submits a treatment demonstration plan in the permit application (see Table 7-2). An applicant should apply for this permit when insufficient treatment information exists to satisfy the treatment demonstration or to at least establish preliminary permit conditions for the full-scale facility. The normal permitting procedures including public comment and hearing, must be followed. After the lab or field tests are complete, the applicant should apply for the full-scale facility permit.

The full-scale facility permit is the "normal" permit used when complete data has been collected to satisfy the treatment demonstration. The applicant would submit both the treatment demonstration plan and results, as well as all the other information described in Table 7-2 for a full-scale facility permit.

The two-phase permit is a combination of the short-term permit and full-scale permit. Phase 1 of the permit includes conditions for the treatment demonstration and Phase 2 includes provisions for the full-scale facility design and operation. This permit should be used in cases in which substantial, but incomplete treatment data exists to satisfy the treatment demonstration, but sufficient data are available to determine the preliminary set of full-scale facility conditions. The applicant submits the same information as for the full-scale

TABLE 7-2. PERMIT APPLICATION CONTENT

Short-Term Treatment Demonstration Permit

- Treatment demonstration plan including provisions to meet the §264.272(c) performance standard (see Section 7.3.3.1).
- Results submitted to the Regional Administrator at end of study (and as part of full-scale facility permit application). (See Section 7.3.3.2 for guidance on results.)

Full-Scale Facility Permit

- Information addressing the general standards applicable to all facilities - §270.14, ("General Information Req."), - See Permit Applicant's Guidance Manual for General Facility Standards
- Information addressing the Subpart M, Part 264 requirements - §270.20 -
  - -- Treatment Demonstration Plan and Results
  - -- Land Treatment Program
  - -- Design and Operating Requirements
  - -- Food Chain Crops
  - -- Closure and Post-Closure Care
  - -- Ignitable and Reactive Waste
  - -- Incompatible Wastes
- Information addressing the ground-water protection requirements in Subpart F, Part 264 (see Ground Water Section of this Manual).

Two-Phase Permit

- Same as for full-scale facility permit except that the results of the treatment demonstration are submitted after completion of the treatment demonstration (Phase 1).

facility permit, except the results of the treatment demonstration are submitted after the completion of the treatment demonstration (Phase 1). The permitting official writes a draft permit for Phases 1 and 2, and then modifies the Phase 2 Permit after the treatment demonstration results are submitted. The primary advantage of the two-phase permit is that it avoids two separate permitting procedures, one for the treatment demonstration and one for the full-scale facility permit.

A final approach for completing treatment demonstration field tests under a permit is available for existing land treatment units with interim status. Because permittees interim status facilities are "treated as though they have been issued permits" (while awaiting completion of the Part 264 permitting process), field tests may be conducted at these units provided that these tests are not carried out in a manner that will lead to a violation of the interim status standards. If the tests are likely to cause a violation of the interim status standards, one of the special permits (short-term or two-phase) described above must be obtained.

In summary, an applicant who can complete the treatment demonstration based on available literature data or operating data from an existing interim status land treatment unit (see Section 7.3) may apply directly for a full-scale facility permit. An applicant who must use laboratory or field studies to complete the treatment demonstration, however, has two options. He may either (1) apply for a short-term treatment demonstration permit and then a full-scale facility permit; or (2) apply for a two-phase permit. In addition, field studies may be completed at an interim status land treatment unit. The applicant is advised to review these various options with the permit writer at the pre-application meeting.

7.3 TREATMENT DEMONSTRATION

7.3.1 Federal Requirement

The Part B permit application for facilities that use land treatment to dispose of hazardous waste must include plans for conducting a treatment demonstration and presenting the complete demonstration results (unless applying for a two-phase permit). As stated in §270.20(a), the Part B application must include:

> A description of plans to conduct a treatment demonstration as required under §264.272. The description must include the following information:
>
> (1) The wastes for which the demonstration will be made and the potential hazardous constituents in the wastes;
>
> (2) The data sources to be used to make the demonstration (e.g., literature, laboratory data, field data, or operating data);
>
> (3) Any specific laboratory or field test that will be conducted, including
>
> (i) the type of test (e.g., column leaching, degradation);
>
> (ii) materials and methods, including analytical procedures;
>
> (iii) expected time for completion;
>
> (iv) characteristics of the unit that will be simulated in the demonstration, including treatment zone characteristics, climatic conditions, and operating practices.

Permit applicants who use existing available data to complete the treatment demonstration or who are issued short-term demonstration permits must submit the demonstration results with the Part B permit application. Applicants who are issued a two phase permit will submit the demonstration results upon completion of testing, as specified in the two-phase permit. (See discussion below regarding short-term and two-phase permits.)

The technical standards in Part 264 listed below define the requirements for a treatment demonstration. Section 264.272(a), (b), and (c) state:

> (a) For each waste that will be applied to the treatment zone, the owner or operator must demonstrate, prior to application of the waste, that hazardous constituents in the waste can be completely degraded, transformed, or immobilized in the treatment zone.
>
> (b) In making this demonstration, the owner or operator may use field tests, laboratory analyses, available data, or in the case of existing units, operating data. If the owner or operator intends to conduct field tests or laboratory analyses in order to make the demonstration required under paragraph (a) of this section, he must obtain a treatment or disposal permit under §270.63. The Regional Administrator will specify in this permit the testing, analytical, design, and operating requirements (including the duration of the tests and analyses, and, in the case of field tests, the horizontal and vertical dimensions of the treatment zone, monitoring procedures, closure, and cleanup activities) necessary to meet the requirements in paragraph (c) of this section.
>
> (c) Any field test or laboratory analysis conducted in order to make a demonstration under paragraph (a) of this section must:
>
> (1) Accurately simulate the characteristics and operating conditions for the proposed land treatment unit including:
>
> (i) The characteristics of the waste (including the presence of Appendix VIII of Part 261 of this chapter constituents);
>
> (ii) The climate in the area;
>
> (iii) The topography of the surrounding area;
>
> (iv) The characteristics of the soil in the treatment zone (including depth); and
>
> (v) The operating practices to be used at the unit.
>
> (2) Be likely to show that hazardous constituents in the waste

to be tested will be completely degraded, transformed, or immobilized in the treatment zone of the proposed land treatment unit; and

(3) Be conducted in a manner that protects human health and the environment considering:

(i) The characteristics of the waste to be tested;

(ii) The operating and monitoring measures taken during the course of the test;

(iii) The duration of the test;

(iv) The volume of waste used in the test;

(v) In the case of field tests, the potential for migration of hazardous constituents to ground water or surface water.

7.3.2 Guidance on Achieving the Part 264 Standard

The treatment demonstration required under §264.272(a) can be accomplished using information derived from published literature, laboratory studies, field studies and/or actual land treatment unit operation experience (i.e., monitoring results). Successful demonstrations will most often involve data obtained from several of these sources.

EPA has not yet defined a specific battery of tests that must be included in a treatment demonstration. Thus, the applicant will select the specific tests to conduct when preparing the treatment demonstration plan. Regardless of which tests, if any, are conducted and which data sources (literature, operating data, lab tests, or field trials) are used, the applicant's demonstration must quantitatively assess the degradation, transformation, mobility, volatility, and toxicity of hazardous constituents in the treatment zone. (Transformation pertains to reactions in which compounds are chemically changed to larger molecular weight compounds. Photolysis and hydrolysis reactions may yield such results. Transformation may be addressed along with degradation.)

By stating in §264.272 that the owner or operator must demonstrate "complete" treatment (i.e., degradation, transformation, or immobilization) of hazardous constituent, the Agency intends that the demonstration should provide sufficient data to allow one to confidently predict that hazardous constituents can be treated at the proposed unit to the extent necessary to prevent statistically significant releases of these constituents from the treatment zone. The quantity of data needed to demonstrate "complete" treatment will vary depending on the treatment process examined. For example, degradation data must clearly show that the constituent is being degraded at a rate that will ensure that no statistically significant releases will occur. Mobility study results must show that no significant migration has occurred during the study, in which the conditions of the proposed unit must be accurately simulated.

There are numerous laboratory methods for assessing degradation, transformation, mobility, volatility, and toxicity of hazardous constituents in soil. Typical types of laboratory tests are listed in Table 7-3. The applicant may use other published procedures or design laboratory methods more specific to the applicant's needs.

When the information needed for a treatment demonstration is beyond the scope of laboratory or greenhouse experiments, field tests should be conducted. Field tests allow the least control over experimental conditions and may require extensive replication to obtain useful results. Field tests should be used only to assess the factors which cannot be simulated in the laboratory or greenhouse, such as odor control or mechanical waste application techniques. The applicant is referred to Hazardous Waste Land Treatment (1) and RCRA Guidance Document: Land Treatment Units (2) for information on conducting a treatment demonstration, selecting tests, and designing test procedures.

TABLE 7-3. TYPICAL LABORATORY TESTS FOR ASSESSING DEGRADATION, TOXICITY, TRANSFORMATION, VOLATILITY, AND MOBILITY OF HAZARDOUS WASTE CONSTITUENTS

Type of Test	Typical Results
Soil Respirometer Tests	Degradation Rate, Microbial Toxicity
Soil Incubation Tests	Degradation Rate, Transformation
Volatility Tests	Flux of Volatile Constituents
Soil Thin layer Chromatography Tests	Mobility
Column Leaching Tests	Mobility
Batch Sorption Tests	Mobility
Extractability Tests	Mobility and Transformation
Microbial Mutagenesis Tests	Toxicity and Transformation

If an applicant intends to conduct field or laboratory analyses as part of the treatment demonstration, the unit must first obtain a treatment or disposal permit. As discussed in Section 7.2, EPA may issue a short-term permit covering only field testing and/or laboratory analyses, or a two-phase facility permit covering the treatment demonstration and facility design, construction, and maintenance. Alternatively, treatment demonstration field tests may be conducted at existing land treatment units with interim status provided that the field tests are not conducted in a manner that will lead to a violation of the interim status standards. Section 270.63 defines the nature of these permits (short-term or two-phase) and the conditions under which they will be issued. §270.63 states:

> Permits for land treatment demonstrations using field tests or laboratory analyses.
>
> (a) For the purpose of allowing an owner or operator to meet the treatment demonstration requirements of §264.272 of this chapter, the EPA Regional Administrator may issue a treatment demonstration permit. The permit must contain only those requirements necessary to meet the standards in §264.272(c). The permit may be issued either as a treatment or disposal permit covering only the field tests, or laboratory analyses, or as a two-phase facility permit covering the field tests, or laboratory analyses and design, construction, operation and maintenance of the land treatment unit.
>
> (1) The EPA Regional Administrator may issue a two-phase facility permit if he finds that, based on information submitted in Part B of the application, substantial although incomplete or inconclusive, information already exists upon which to base the issuance of a facility permit.
>
> (2) If the EPA Regional Administrator finds that not enough information exists upon which he can establish permit conditions to attempt to provide for compliance with all of the requirements of Subpart M, he must issue a treatment demonstration permit covering only the field tests or laboratory analyses.
>
> (b) If the EPA Regional Administrator finds that a phased permit may be issued, he will establish, as requirements in the first phase of the facility permit, conditions for conducting the field tests or laboratory analyses. These permit conditions will include design and operating parameters (including the duration of the tests or analyses and, in the case of field tests, the horizontal and vertical dimensions of the treatment zone), monitoring procedures post-demonstration clean-up activities, and any other conditions which the Director finds may be necessary under §264.272(c). The Director will include conditions in the second phase of the facility permit to attempt to meet all Subpart M requirements pertaining

to unit design, construction, operation, and maintenance. The Director will establish these conditions in the second phase of the permit based upon the substantial but incomplete or inconclusive information contained in the Part B application.

(1) The first phase of the permit will be effective as provided in §124.15(b) of this Chapter.

(2) The second phase of the permit will be effective as provided in paragraph (d) of this section.

(c) When the owner or operator who has been issued a two-phase permit has completed the treatment demonstration, he must submit to the EPA Regional Administrator a certification, signed by a person authorized to sign a permit application or report under §270.11, that the field tests or laboratory analyses have been carried out in accordance with the conditions specified in phase one of the permit for conducting such tests or analyses. The owner or operator must also submit all data collected during the field tests or laboratory analyses within 90 days of completion of those tests or analyses unless the EPA Regional Administrator approves a later date.

(d) If the EPA Regional Administrator determines that the results of the field tests or laboratory analyses meet the requirements of §264.272 of this Chapter, he will modify the second phase of the permit to incorporate any requirements necessary for operation of the facility in compliance with Part 264, Subpart M, of this Chapter, based upon the results of the field tests or laboratory analyses.

(1) This permit modification may proceed as a minor modification under §122.17, provided any such change is minor, or otherwise will proceed as a modification under §122.15(a)(2).

(2) If no modifications of the second phase of the permit are necessary, or if only minor modifications are necessary and have been made, the EPA Regional Administrator will give notice of his final decision to the permit applicant and to each person who submitted written comments on the phased permit or who requested notice of final decision on the second phase of the permit. The second phase of the permit then will become effective as specified in §124.15(b).

(3) If modifications under §122.15(a)(2) are necessary, the second phase of the permit will become effective only after these modifications have been made.

7.3.3 Guidance on Addressing the Permit Application Information Requirement

7.3.3.1 Treatment Demonstration Plan --

The information required for a treatment demonstration plan in the Part B application is identified in §270.20, as previously defined. The items for submittal listed below are recommendations to the permit applicant for providing the required information. A suggested attachment to the permit application is Treatment Demonstration Plan.

7.3.3.1.1 Wastes for treatment demonstration plan --

Part 1. Submit a list of all wastes that will be included in the treatment demonstration. The list should include all wastes, both hazardous and nonhazardous, destined for the proposed land treatment unit. While permit authorization or a treatment demonstration is not required for land treatment of nonhazardous waste, the presence of nonhazardous wastes or nonhazardous waste constituents within the same treatment zone will affect degradation, transformation, and immobilization of hazardous constituents. Therefore, it is essential that the applicant submit information concerning nonhazardous wastes and waste constituents to be consistent with requirements for the "Treatment Demonstration" and to establish conditions for maximum treatment in the "Land Treatment program." The following information on each waste should be reported:

- Common name
- Generating process or source
- Expected monthly quantity, including actual or estimated averages, maximum and minimum

- Form of the waste and approximate moisture content; and
- EPA hazardous waste ID number (if applicable).

Please use the example format given on the following table.

TABLE 7-4. FORMAT FOR LISTING WASTES THAT WILL BE MANAGED IN THE LAND TREATMENT UNIT

Name of Waste	Generating Process or Source	Monthly or Annual Quantity	EPA Hazardous Waste ID ic.
1. Oil/Water Separator Sludge	Crude Topping Unit	60 MT	K051
2. Leaded Tank Bottom	Leaded Gasoline Storage	100 MT	K052
3. Treated Wastewater	Refinery Wastewater Treatment Plant	50,000 MT	Non-hazardous

Part 2. For each hazardous waste listed in Part 1 above, submit the names of all potentially hazardous constituents (see §261 Appendix VIII), and pertinent nonhazardous constituents reasonably expected to be present in or derived from the waste. This list should be based on information about the generating process, source of the waste, and chemical analyses. "Pertinent" nonhazardous constituents means any nonhazardous constituents that will likely affect the degradation, transformation, or immobilization of hazardous constituents.

Part 3. Submit the results of a quantitative analysis of each waste listed in Part 1 above if not previously submitted. Test Methods for Evaluating Solid Waste (3) provides methods and procedures for representative sampling and analysis of waste materials. Include the following information:

- Concentration of each hazardous constituent listed in Part 2 above expressed on a mass basis (use total concentration, not EP toxicity data);

- Concentration of gaseous or easily volatilized hazardous constituents at 25° C, volatile hazardous constituents from 25° C to 105° C, volatile hazardous constituents from 105 C to 250° C and stable constituents above 250° C [for procedures see Hazardous Waste Land Treatment (1)];

- Percent water;
- Specific gravity or bulk density;
- pH;
- Electrical conductivity;
- Total acidity or alkalinity;
- Total organic carbon.

7.3.3.1.2 Data sources for treatment demonstration -- For each hazardous constituent listed in the waste, identify the information sources (e.g., published literature, field data, operating records, laboratory tests, field tests) that will be used to make the treatment demonstration. For each source, describe the data expected to be obtained from the source and how it will be used in the demonstration.

7.3.3.1.3 Laboratory and field test design --If laboratory analyses or field testing will be used as a source of data in the treatment demonstration, the applicant should describe the design of each test in detail by submitting the following information.

Part 1. For each proposed laboratory test, submit an explanation of each test which includes the following information:

- Name of test;
- Objective of test;
- Materials and methods (a step-by-step explanation of the test including analytical methods, experimental design, statistical methods, sampling, equipment, monitoring, etc.);
- Schedule of completion;
- List of operating conditions or characteristics that will or will not be simulated in the test such as climate, soil properties, and waste application methods; and
- Description of the data that will be obtained from the test and how it will be presented in final form.

The explanation should include sufficient detail for a third party to conduct or repeat the test if desired.

Part 2. For each field test, prepare a written description of how the test is designed and how it will be conducted. Include the following information:

- The objective of the test;
- A scale drawing showing the location of test plots relative to the proposed land treatment unit;
- Number and size of test plots;
- Statistical design of the test;
- Horizontal and vertical dimensions of the treatment zone for the field test plots;
- Preparation of test plots (e.g. tillage, liming, fertilizer, installation of monitoring devices, surface water control structures, etc.);
- Waste application rate on each plot, method of waste application, and soil incorporation techniques;
- Irrigation methods and scheduling;

- Methods for establishing and maintaining vegetation (if plots will be vegetated);
- Methods for measuring and recording daily meteorological data;
- Procedures for monitoring soil, soil-pore liquid, run-off, vegetation, ground water, and air, as applicable;
- A daily schedule of events and activities;
- Rationale for design and management of field tests to preclude the migration of hazardous constituents to ground or surface water;
- The type of data expected from the test and how it will be presented; and
- Clean-up procedures upon completion of field tests.

7.3.3.3 Treatment Demonstration Results --

Permit applicants should submit the following treatment demonstration results with the Part B permit application. Permittee that are issued two-phase permits, however, will submit demonstratio results upon completion of testing as specified in the two-phase permit.

7.3.3.3.1. Wastes and waste composition -- If the wastes used in the treatment demonstration differ in composition from the information submitted in the treatment demonstration plan, identify the wastes for which the demonstration was made and provide a physical and chemical characterization of each waste. Submit the information as prescribed in Section 7.3.3.1.1, Part 1. Pretreatment or mixing of wastes should also be noted.

7.3.3.3.2 Degradation/transformation -- Submit information on the rate and extent of degradation or transformation of the specific organic hazardous constituents identified in

Section 7.3.3.3.1 plus degradation of the bulk organic fraction of the waste(s) in the following Parts:

Part 1. If existing literature will be used to demonstrate degradation of hazardous constituents or bulk organics, submit a brief written review of scientific literature and previous studies that contain pertinent information. Sources of informa- should be documented with citations in the text and a bibliography. Photocopies of tables, graphs, or figures should be included as deemed appropriate by the applicant. The test procedures should be described, and the test results presented in detail, as described below under Part 3 (laboratory tests) or Part 4 (field tests).

Part 2. If operating data from existing land treatment units were used to demonstrate degradation, submit a description of the existing facility, operational records, waste composition, waste application rates, and data demonstrating degradation of hazardous constituents and/or bulk organics. At a minimum, include the analytical results of soil sampling for hazardous constituents and a plot of percent degradation or transformation as a function of time for each waste application treatment.

Part 3. If laboratory test results were used to demonstrate degradation or transformation of hazardous constituents or degradation of bulk organics, submit the following information concerning each test as described below.

- Name of test.
- Test procedures. Test procedures should be explained in a step-by-step fashion and include a description of laboratory apparatus, experimental design, waste application rates, preparation and handling of soil and waste, analytical methods, sampling procedures, and test conditions.

- Test results. Results of the test should be presented in tables and graphs as appropriate for the particular laboratory test. As mentioned in Section 7.2, there are many laboratory tests that an applicant may choose to demonstrate waste degradation and/or transformation. Each particular test, however, often lends itself to a particular form or method of presenting test results. For example, if the applicant intends to demonstrate degradability with soil respirometry tests, the results should be presented in at least two graphs. One graph should show CO_2 evolution as a function of time for each waste application treatment including a no waste control. A second graph should show the percent of carbon degraded (based on CO_2 evolution) as a function of time for each waste application treatment.

  If degradation or transformation will be demonstrated by periodic sampling of incubated soil and waste mixtures, test results should be presented in two graphs, one showing the residual concentration of a particular waste constituent in the soil as a function of time and another showing percent degradation as a function time.

  In addition to test specific tables or graphs, the applicant should calculate the half life of each organic hazardous constituent in the treatment zone and identify the waste application rate which exhibits the optimum waste degradation rate. Further discussion on presenting test results and performing calculations is contained in Hazardous Waste and Treatment (1).

- Discussion. Test results should be discussed and explained as needed to interpret the results.

Part 4. If field test results were used to demonstrate degradation of hazardous constituents or bulk organics, the following information should be submitted:

- Field test objectives. The objectives and function of the field test should be stated briefly and concisely.

- Field test procedures. Describe how the field test was designed and conducted including the information listed in Table 7-5. Note any changes from test design described in the Treatment Demonstration Plan.

- Field test results. Present test data in tables and graphs as needed to demonstrate degradation or transformation of organic hazardous constituents. Include the analytical results of soil sampling for hazardous constituents and a plot of percent degradation or transformation as a function of time for each waste application treatment. Also, calculate the half life of each organic hazardous constituent in the treatment zone and identify the waste application rate that exhibits the optimum degradation rate.

- Discussion. Provide discussion and explanation of the field test results as needed for interpretation.

7.3.3.3.3. Immobilization -- Information should be submitted that addresses the potential for organic and inorganic hazardous constituents to migrate from the treatment zone under typical waste application rates and operating conditions. There are several methods for estimating the mobility of various elements and compounds in soil discussed in Hazardous Waste Land Treatment (1) (see Table 7-3 for typical methods). A substantial amount of published information exists concerning the mobility of inorganic elements and compounds while information concerning the mobility

TABLE 7-5. GENERAL INFORMATION TO BE INCLUDED IN FIELD TEST DESCRIPTIONS

Location of test plots relative to the land treatment unit.	Method of waste application and soil incorporation techniques.
Number and size of test plots.	Irrigation methods and frequency.
Dimensions of treatment zone for field test plots.	Rainfall and temperature data collected during the test.
Preparation of field test plots.	Sampling schedule and procedures.
Soil properties.	Analytical methods.
Waste application rate on each plot.	Statistical methods.
	Photographs of test plots.

of organic compounds in soil is rather scarce. The following information should be submitted:

Part 1. If data contained in existing literature were used to demonstrate immobilization of hazardous constituents in the treatment zone, the applicant should prepare and submit a brief review of scientific literature and previous studies that document the mobility of the constituents under consideration. The review should include references to the literature and a bibliography. Photocopies of specific data such as tables or graphs should be included as necessary. The test procedures should be described, and test results presented in the cited literature, in detail similar to that described below under Part 3 (laboratory tests).

Part 2. If operating data from existing land treatment units were used in the demonstration, submit a description of the existing facility, operational records, waste characteristics, waste application rates, and analytical data reflecting the mobility of hazardous constituents. Sampling procedures and analytical methods should be included with the data. The monitoring data should be presented in detail similar to that described below for field tests (Part 4).

Part 3. If laboratory test results were used to assess the mobility of hazardous constituents, submit the following information concerning each test:

- Name of test.
- Test objectives. Describe the objectives and function of the test briefly and concisely.

- Test procedures. Explain test procedures in a step-by-step fashion including a description of laboratory apparatus, experimental design, waste application rates, preparation and handling of soil and waste, sampling procedures, analytical methods, and test conditions.

- Test results. Present the test results in tables as appropriate for the particular laboratory test. Column leach tests are the most widely used method to demonstrate immobilization, and these test results should be presented as a breakthrough curve. A breakthrough curve is a graph showing the concentration of hazardous constituents in the effluent, relative to the concentration in the influent plotted as a function of the number of soil pore volumes of liquid passed through the column. See Hazardous Waste Land Treatment (1) for an example breakthrough curve.

  Soil thin layer chromatography test results should be presented as R_f values, the relative mobility of a compound or element relative to a compound or element of known mobility. If batch sorption tests are used, the results should be presented as sorption isotherms, the amount of the compound or element sorbed plotted as a function of the solution concentration. Subsequent desorption experiments will indicate the strength of the sorption and the reversibility of the reaction.

  If extractability tests are used, the results should be presented in tables showing the relative solubility of the sorbed element or compound in various extracting solutions. There are other methods of assessing mobility not mentioned here and other methods of presenting test results. While the breakthrough curve is generally accepted for expressing mobility, the applicant should present test results in the form that is most appropriate for the tests being conducted.

- Discussion. Provide written explanation as needed to interpret test results.

Part 4. If field tests were used to demonstrate immobilization of hazardous constituents, submit the following information as described below.

- Field test objectives. The objectives of the test should be stated briefly and concisely.

- Field test procedures. Describe how the field test was designed and conducted including the information listed in Table 7-5. Note any changes from the test design described in the Treatment Demonstration Plan.
- Field test results. Present test data in tables and graphs as needed to demonstrate the rate and extent of hazardous constituents migration during the field test. Typically, test results are presented as separate graphs showing: the concentration of hazardous constituents in the soil as a function of depth at various times during the field test; the concentration of hazardous constituents in the soilpore fluid at various depths plotted as a function of time; the concentration of hazardous constituents in rainfall run-off as a function of the depth of rainfall; and the concentration of hazardous constituents in the ground water underlying field test plots.

7.3.3.3.4 Volatilization -- Volatilization of hazardous constituents is generally limited to organic compounds with relatively high vapor pressure. Volatilization of hazardous constituents does not constitute degradation, transformation, or immobilization. Therefore, data addressing volatilization of potentially volatile hazardous constituents should be included in the treatment demonstration results in order to confirm treatment of these hazardous constituents. Extensive quantitative data need not be submitted provided it can be shown that volatilization will not be a significant release mechanism for the hazardous constituent in question. Methods for estimating and controlling volatilization are discussed in Hazardous Waste Land Treatment (1). Data sources for estimating volatilization include existing literature, previous operating data, laboratory tests, and field tests.

Part 1. If existing literature were used to evaluate the amount of hazardous constituents that are volatilized from the treatment zone, submit a brief review of the literature that includes the vapor pressure of each organic hazardous constituent in millimeters of mercury at standard temperature; estimated flux of each hazardous constituent volatilized from the soil expressed as the mass or concentration per unit area of soil as a function of time; and other pertinent information. The review should be documented with sources of information and a bibliography. Photocopies of tables or figures should be included as deemed appropriate.

Part 2. If operating data were used to evaluate volatilization of hazardous constituents, submit a description of the existing facility, operational records, waste composition, waste application rates and data addressing the volatilization of hazardous constituents from the treatment zone.

Part 3. If laboratory tests were used to evaluate volatilization of hazardous constituents from the treatment zone, submit the following information as described below.

- Name of test.
- Test procedures. Explain test procedures in a step-by-step fashion and include a description of laboratory apparatus, experimental design, waste application rates, preparation and handling of soil and waste, analytical methods, sampling procedures, and test conditions.
- Test results. Present test results in a graph showing the mass or concentration of hazardous constituents volatilized per unit area of soil as a function of time for various waste application rates.
- Discussion. Explain test data as necessary to interpret test results and draw conclusions.

Part 4. If field tests will be used to evaluate volatilization of hazardous constituents from the treatment zone, submit the following information as described below:

- Test objectives. Briefly state the objectives of the field test with respect to volatilization of hazardous constituents.
- Test procedures. Describe how the field test was designed and conducted including the information listed in Table 7-4
- Test results. Present test results in a graph showing the mass or concentration of hazardous constituents volatilized per unit area of soil as a function of time for various waste application rates.
- Discussion. Explain test data as needed to interpret results and formulate conclusions.

7.3.3.3.5. Microbial toxicity --The toxicity of a waste to soil microbes may influence degradation and transformation of the waste and its hazardous constituents and is an important consideration in assessing the treatability of a waste. Obviously, if a waste is highly toxic to the soil's microbial population, the waste cannot be readily biodegraded unless it is applied to the soil at a rate that is below the threshold of toxic effects. Acute microbial toxicity of a waste to microbes can often be evaluated simultaneously with an assessment of degradation using existing field tests.

Part 1. If existing literature were used to demonstrate that the toxicity of the waste(s) will not prevent or restrict degradation or transformation of hazardous constituents, submit a brief review of scientific literature or previous studies that contain information concerning toxicity of the waste or its constituents to soil microbes. Sources of information should be documented with citations and a bibliography. Photocopies of tables, graph, or figures should be included as deemed appropriate.

Part 2. If operating data were used to evaluate microbial toxicity of the waste, submit a description of the existing facility, operational record, waste composition, waste application rates and data to evaluate the toxicity of the waste. Operating data should be presented in tables or graphs that show relative microbial activity as a function of time for various concentrations of waste in the soil.

Part 3. If laboratory test results were used to evaluate the microbial toxicity of the waste, submit the following information as described below.

- Name of test.
- Test procedures. Explain test procedures in a step-by-step fashion and include a description of laboratory apparatus, experimental design, waste application rates preparation and handling of soil and waste, analytical methods, sampling procedures and test conditions.
- Test results. Results of the tests should be presented in tables or graphs that show relative microbial activity as a function of time for various concentrations of waste in the soil.
- Discussion. Explain test data as necessary to interpret the test results and draw conclusions.

Part 4. If field test results were used to demonstrate that the toxicity of the waste will not prevent or restrict degradation of hazardous constituents, submit the following information as described below.

- Test objective. Briefly state the objective of the field test(s) with respect to microbial toxicity.
- Test procedures. Describe how the field test was designed and conducted including the information listed in Table 7-4.
- Test results. Present the test results in tables or graphs that show relative microbial activity as a function of time at various waste application rates or operating conditions.

7.3.3.3.6. Phytotoxicity -- If nondegradable hazardous constituents will be immobilized in the treatment zone and vegetative cover will be used as an integral part of facility design (e.g., for wind dispersal control) during the operating life, data concerning the phytotoxicity of these residuals to the planned cover crop should be submitted in the treatment demonstration. The phytotoxicity of residuals may be determined from existing literature, operational data, greenhouse tests, or field tests.

Part 1. If existing literature were used to determine the phytotoxicity of the waste(s), submit a brief review of the literature including the concentration of waste in the soil that causes a specified decrease in plant growth. Information such as the plant species, waste application rates, and test procedures should be included. Literature should be cited in the text with a bibliography.

Part 2. If operating data from an existing land treatment unit were used to evaluate the phytotoxicity of the waste, submit a description of the existing facility, operational records, waste application rates, and data indicating the toxicity of the waste.

Part 3. If greenhouse tests were used to assess phytotoxicity, submit test data and a description of test procedures including apparatus, experimental design, waste application rates, waste application schedule, and plant varieties. Test data submitted should show the concentration of waste in the soil that causes a specified decrease in plant growth.

Part 4. If field tests were used to evaluate the phytotoxicity of the waste, submit the following information as described below.

- Test objective. Briefly state the objectives of the test with respect to evaluating phytotoxicity.
- Test procedures. describe how the field test was designed and conducted including the information in Table 7-5.
- Test results. Present test results in tables or graphs to show the concentration of waste or waste constituents that cause a specified decrease in plant growth or plant survival.
- Discussion. Explain test data as needed to interpret test results and draw conclusions.

7.4 LAND TREATMENT PROGRAM

7.4.1 Federal Requirement

Section 270.20(b) states that the Part B permit application shall include:

> (b) A description of a land treatment program, as required under §264.271. This information must be submitted with the plans for the treatment demonstration, and updated following the treatment demonstration. The land treatment program must address the following items:
>
> (1) The wastes to be land treated;
>
> (2) Design measures and operating practices necessary to maximize treatment in accordance with §264.273(a) including:

(i) Waste application method and rate;

(ii) Measures to control soil pH; (iii) Enhancement of microbial or chemical reactions;

(iv) Control of moisture content;

(3) Provisions for unsaturated zone monitoring, including:

(i) Sampling equipment, procedures, and frequency;

(ii) Procedures for selecting sampling locations;

iii) Analytical procedures;

(iv) Chain of custody control;

(v) Procedures for establishing background values;

(iv) Statistical methods for interpreting results;

(vi) The justification for any hazardous constituents recommended for selection as principal hazardous constituents, in accordance with the criteria for such selection in §264.278(a);

(4) A list of hazardous constituents reasonably expected to be in, or derived from, the wastes to be land treated based on waste analysis performed pursuant to §264.13;

(5) The proposed dimensions of the treatment zone.

As evident above, there are several Part 264 standards upon which the information requirement is based.

With respect to the land treatment program, the specific technical standard is contained in §264.271, which states:

(a) An owner or operator subject to this subpart must establish a land treatment program that is designed to ensure that hazardous constituents placed in or on the treatment zone are degraded, transformed, or immobilized within The Regional Administrator will specify in the facility permit the elements of the treatment program, including:

(1) The wastes that are capable of being treated at the unit based on a demonstration under §264.272;

> (2) Design measures and operating practices necessary to maximize the success of degradation, transformation, and immobilization processes in the treatment zone in accordance with §264.273(a); and
>
> (3) Unsaturated zone monitoring provisions meeting the requirements of §264.278.
>
> (b) The Regional Administrator will specify in the facility permit the hazardous constituents that must be degraded, transformed, or immobilized under this subpart. Hazardous constituents are constituents identified in Appendix VIII of Part 261 of this chapter that are reasonably expected to be in or derived from waste placed in or on the treatment zone.
>
> (c) The Regional Administrator will specify the vertical and horizontal dimensions of the treatment zone in the facility permit. The treatment zone is the portion of the unsaturated zone below and including the land surface in which the owner or operator intends to maintain the conditions necessary for effective degradation, transformation, or immobilization of hazardous constituents. The maximum depth of the treatment zone must be:
>
> (1) No more than 1.5 meters (5 feet) from the initial soil surface; and
>
> (2) More than 1 meter (3 feet) above the seasonal high water table.

§264.271(a)(2) requires that the facility permit include design measures and operating practices to maximize treatment in accordance with §264.273(a), which states:

> (a) The owner or operator must design, construct, operate, and maintain the unit to maximize the degradation, transformation, and immobilization of hazardous constituents in the treatment zone. The owner or operator must design, construct, operate, and maintain the unit in accord with all design and operating conditions that were used in the treatment demonstration under §264.272. At a minimum, the Regional Administrator will specify the following in the facility permit:
>
> (1) The rate and method of waste application to the treatment zone;
>
> (2) Measures to control soil pH;

(3) Measures to enhance microbial or chemical reactions (e.g. fertilization, tilling); and

(4) Measures to control the moisture content of the treatment zone.

§264.271(a)(3) requires that the facility permit include unsaturated zone monitoring provisions that meet the requirements of §264.278, which states that the owner or operator must establish an unsaturated zone monitoring program to discharge the following responsibilities:

(a) The owner or operator must monitor the soil and soil-pore liquid to determine whether hazardous constituents migrate out of the treatment zone.

(1) The Regional Administrator will specify the hazardous constituents to be monitored in the facility permit. The hazardous constituents to be monitored are those specified under §264.271(b).

(2) The Regional Administrator may require monitoring for principal hazardous constituents (PHCs) in lieu of the constituents specified under §264.271(b). PHCs are hazardous constituents contained in the wastes to be applied at the unit that are most difficult to treat, considering the combined effects of degradation, transformation, and immobilization. The Regional Administrator will establish PHCs if he finds, based on waste analyses, treatment demonstrations, or other data, that effective degradation, transformation, or immobilization of the PHCs will assure treatment of at least equivalent levels for the other hazardous constituents in the wastes.

(b) The owner or operator must install an unsaturated zone monitoring system that includes soil monitoring using soil cores and soil-pore liquid monitoring devices such as lysimeters. The unsaturated zone monitoring system must consist of a sufficient number of sampling points at appropriate locations and depths to yield samples that:

(1) Represent the quality of background soil-pore liquid quality and the chemical makeup of soil that has not been affected by leakage from the treatment zone; and

(2) Indicate the quality of soil-pore liquid and the chemical make-up of the soil below the treatment zone.

(c) The owner or operator must establish a background value for each hazardous constituent to be monitored under paragraph (a) of this section. The permit will specify the background values for each constituent or specify the procedures to be used to calculate the background values.

(1) Background soil values may be based on a one-time sampling at a background plot having characteristics similar to those of the treatment zone.

(2) Background soil-pore liquid values must be based on at least quarterly sampling for one year at a background plot having characteristics similar to those of the treatment zone.

(3) The owner or operator must express all background values in a form necessary for the determination of statistically significant increases under paragraph (f) of this section.

(4) In taking samples used in the determination of all background values, the owner or operator must use an unsaturated zone monitoring system that complies with paragraph (b)(1) of this section.

(d) The owner or operator must conduct soil monitoring and soil-pore liquid monitoring immediately below the treatment zone. The Regional Administrator will specify the frequency and timing of soil and soil-pore liquid monitoring in the facility permit after considering the frequency, timing, and rate of waste application, and the soil permeability. The owner or operator must express the results of soil and soil-pore liquid monitoring in a form necessary for the determination of statistically significant increases under paragraph (f) of this section.

(e) The owner or operator must use consistent sampling and analysis procedures that are designed to ensure sampling results that provide a reliable indication of soil-pore liquid quality and the chemical make-up of the soil below the treatment zone. At a minimum, the owner or operator must implement procedures and techniques for:

- Sample collection;

- Sample preservation and shipment;

- Analytical procedures; and

- Chain of custody control.

(f) The owner or operator must determine whether there is a statistically significant change over background values for any hazardous constituent to be monitored under paragraph (a) of this section below the treatment zone each time he conducts soil monitoring and soil-pore liquid monitoring under paragraph (d) of this section.

(g) The owner or operator must use consistent sampling and analysis procedures that are designed to ensure sampling results that provide a reliable indication of soil-pore liquid quality and the chemical make-up of the soil below the treatment zone. At a minimum, the owner or operator must implement procedures and techniques for:

- Sample collection;

- Sample preservation and shipment;

- Analytical procedures; and

- Chain of custody control

(f) The owner or operator must determine whether there is a statistically significant change over background values for any hazardous constituent to be monitored under paragraph (a) of this section below the treatment zone each time he conducts soil monitoring under paragraph (d) of this section.

(1) In determining whether a statistically significant increase has occurred, the owner or operator must compare the value of each constituent, as determined under paragraph (d) of this section, to the background value for that constituent according to the statistical procedure specifie in the facility permit under this paragraph.

(2) The owner or operator must determine whether there has been a statistically significant increase below the treatme zone within a reasonable time period after completion of sampling. The Regional Administrator will specify that time period in the facility permit after considering the complexity of the statistical test and the availability of laboratory facilities to perform the analysis of soil and soil-pore liquid samples.

(3) The owner or operator must determine whether there is a statistically significant increase below the treatment

zone using a statistical procedure that provides reasonable confidence that migration from the treatment zone will be identified. The Regional Administrator will specify a statistical procedure in the facility permit that he finds:

(i) is appropriate for the distribution of the data used to establish background values; and

(ii) provides a reasonable balance between the probability of falsely identifying migration from the treatment zone and the probability of failing to identify real migration from the treatment zone.

(g) if the owner or operator determines, pursuant to paragraph (f) of this section, that there is a statistically significant increase of hazardous constituents below the treatment zone, he must:

(1) Notify the Regional Administrator of this finding in writing within seven days. The notification must indicate what constituents have shown statistically significant increases.

(2) Within 90 days, submit to the Regional Administrator an application for a permit modification to modify the operating practices at the facility in order to maximize the success of degradation, transformation, or immobilization processes in the treatment zone.

(h) If the owner or operator determines, pursuant to paragraph (f) of this section, that there is a statistically significant increase of hazardous constituents below the treatment zone, he may demonstrate that a source other than regulated units caused the increase or that the increase resulted from an error in sampling, analysis, or evaluation. While the owner or operator may make a demonstration under this paragraph in addition to, or in lieu of, submitting a permit modification application under paragraph (g)(2) of this section, he is not relieved of the requirement to submit a permit modification application within the time specified in paragraph (g)(2) of this section unless the demonstration made under this paragraph successfully shows that a source other than regulated units caused the increase or that the increase resulted from an error in sampling, analysis, or evaluation. In making a demonstration under this paragraph, the owner or operator must:

(1) Notify the Regional Administrator in writing within seven days of determining a statistically significant increase below the treatment zone that he intends to make a determination under this paragraph;

(2) Within 90 days, submit a report to the Regional Administrator demonstrating that a source other than the regulated units caused the increase or that the increase resulted from an error in sampling, analysis, or evaluation;

(3) Within 90 days, submit to the Regional Administrator an application for a permit modification to make any appropriate changes to the unsaturated zone monitoring program at the facility; and

(4) Continue to monitor in accordance with the unsaturated zone monitoring program established under this section.

7.4.2 Guidance on Achieving the Part 264 Standard

§264.271(a) requires each owner or operator to establish a land treatment program that is designed to ensure that hazardous constituents placed in or on the treatment zone are degraded, transformed, or immobilized within the treatment zone. This program must include (1) wastes that are capable of being treated at the land treatment unit, (2) design measures and operating procedures that maximize treatment in the treatment zone, and (3) an effective unsaturated zone monitoring system.

The completion of treatment demonstration testing (see Section 7.3 above) will allow selection of acceptable waste(s). Guidance on appropriate design measures and operating practices can be found in Hazardous Waste Land Treatment (1) and RCRA Guidance Document: Land Treatment Units (2). For guidance on unsaturated zone monitoring, sampling methods, and analytical procedures, the applicant is referred to the above-named documents as well as Test Methods for Evaluating Solid Waste (3).

7.4.3 Guidance on Addressing the Application Information Requiremer

A suggested attachment to the permit application is Land Treatment Programs. It should include the following.

7.4.3.1 **Wastes for Land Treatment Program** --

Submit a list of all hazardous wastes and hazardous constituents to be included in the land treatment program (similar to the list described in Section 7.3.3.1.1)

7.4.3.2 Waste Application Rate and Methods --

Part 1. The applicant should submit a table listing each waste constituent listed in Section 7.4.3.1, its respective application limit (AL), rate limit (RL), and capacity limit (CL), plus a brief discussion of the rationale for assessing each limit. Refer to the technical resource document, Hazardous Waste Land Treatment (1), for an explanation of these various limits and how to assess their values with respect to degradation, transformation, toxicity, and mobility. Include calculations and follow the example format in Table 7-6.

TABLE 7-6. FORMAT FOR REPORTING APPLICATION, RATE, AND CAPACITY LIMITS

Waste Constituent	Limit	Value	Discussion
Phenol	AL	1.1×10^3 kg/ha (1×10^3 lb/a)	Concentration ≥ 500 mg/kg soil are phytotoxic and inhibit microbial activity
	RL	70 kg/ha/yr (62 lb/a/yr)	Optimum degradation rate is 70 kg/ha/yr (62 lb/a/yr)
Lead	AL	None	
	RL	None	
	CL	2.2×10^3 kg/ha (2×10^3 lb/a)	Not to exceed 1000 mg/kg

Part 2. Prepare and submit a table which lists each waste constituent identified in Section 7.4.3.1, its respective concentration in the waste, and the necessary quantity of waste applied per hectare to reach that constituent's respective AL, RL, and CL. One the example format in Table 7-7. On the table, identify the application limiting constituent (ALC), rate limiting constituent (RLC), and capacity limiting constituent (CLC) with an asterisk. (ALC, RLC, and CLC are those constituents with the lowest amount of waste necessary to reach its respective limit, plus those constituents within 25% of the lowest values).

Part 3. Enclose a monthly waste application schedule based on the ALC, RLC, and CLC for each waste stream, the waste generation rate, seasonal restrictions on waste application, the expected life span of the land treatment unit, and waste application methods. Use the example format in Table 7-8 and show all calculations.

Part 4. Prepare and submit a brief explanation of how and when waste will be applied to the land treatment unit. Explain the chain of events occurring from the point of receiving waste at the land treatment unit to final incorporation of waste in the soil. Although management methods will differ from place to place, the explanation should address the following topics:

- Methods and frequency of waste collection and transport;
- Location, type, and capacity of waste storage units associated with the land treatment unit;
- Waste application equipment;
- Restrictions to waste application such as weather, cropping practices, tillage requirements, and sedimentation; and
- Plot configuration (if waste is applied progressively from plot to plot or otherwise).

TABLE 7-7. FORMAT FOR IDENTIFYING LIMITING CONSTITUENTS (ACLs, RLCs, AND CLCs ARE MARKED WITH AN ASTERISK)

Waste Constituent	Concentration in Waste (mg/kg)	Amount of Waste to Reach AL (kg/ha/Application) (lb/a/Application)	Amount of Waste to Reach RL (kg/ha/yr) (lb/a/yr)	Amount of Waste to Reach CL (kg/ha) (lb/a)
1. Water	8.5×10^5		3.53×10^6 (3.1×10^6)	N/A
2. Phenol	200	5.6×10^6* (5.0×10^6)	3.5×10^5* (3.1×10^3)	N/A
3. Lead	500	N/A	N/A	4.5×10^3* (4.0×10^3)

N/A not applicable.

TABLE 7-8. EXAMPLE WASTE APPLICATION SCHEDULE

Month	Waste Application (kg/mo)	Area to Receive Waste Applications (ha)	Application Rate (kg/ha/mo)
Jan			
Feb			
Mar			
Apr			
May			
Jun			
Jul			
Aug			
Sep			
Oct			
Nov			
Dec			

Totals ________ kg/yr ________ ha ____kg/ha/yr

Total Amount of Available Land: ________ha

Expected Life Span of the Unit: ________years

Expected Total Quantity of Waste Applied Per ha: ________kg/ha

7.4.3.3. Measures to Control Soil pH --

The applicant should submit the following information:

- The current soil pH in the proposed treatment zone based on soil sampling and analysis. Include the mean soil pH and range of values. Soil pH should be measured with a glass electrode in a soil to water ratio of 1:1;
- The minimum and maximum soil pH in the proposed treatment zone that will allow maximum treatment of wastes. Include the rationale for deriving these values; and
- A description of methods to control soil pH including monitoring within the treatment zone for changes in soil pH and methods for calculating the quantity of soil amendments to adjust soil pH, if necessary.

7.4.3.4 Measures to Enhance Microbial or Chemical Reactions --

Prepare and submit a brief written description of measures to enhance waste treatment including the method and frequency of such measures. Typical enhancement measures include incorporating the waste in the soil, aeration of the soil, microbial inoculations, fertilizer application, and establishment of vegetation.

7.4.3.5 Measures to Control Soil Moisture in the Treatment Zone --

Prepare and submit a table indicating monthly gains and losses of water at the land treatment unit. Prepare the table from monthly water balance calculations. Recommended procedures for estimating precipitation, evapotranspiration, run-off, percolation, irrigation needs, and storage requirements are discussed in the technical resource document, Hazardous Waste Land Treatment (1). Include all calculations, assumptions, and sources of information such as meteorological data, computation methods, soil run-off factors, etc. In addition, describe irrigation methods, if any, and subsurface drainage structures, if a . .

7.4.3.6 Unsaturated Zone Monitoring --

Unsaturated zone monitoring plans must be developed for all land treatment units and the required monitoring must be performed. The applicant should submit an unsaturated zone monitoring plan that will demonstrate compliance with applicable standards in §264.278, described above. The plan must, at a minimum, include the information discussed below.

Part 1. Sampling Location. On a scale drawing of the land treatment unit show the location of soil-pore liquid sampling devices and locations for taking soil samples. For each location specify the depth if installation for soil-pore liquid sampling devices and depth of soil samples to be collected. Include the rationale for selecting the number and position of sampling locations to provide statistically representative samples.

Part 2. Sampling Frequency. Prepare a schedule for sampling the soil-pore liquid and soil below the treatment zone. Include a rationale for the proposed sampling frequency which shows consideration of the waste application rate, waste application schedule, climatic factors, and the hydraulic conductivity of the treatment zone.

Part 3. Sampling Equipment. Identify and describe the equipment that will be used to obtain both soil core samples and soil-pore liquid samples. Include information such as the name and manufacturer of sampling devices, recommended operating procedures and limitations, and the compositing of materials that will be in direct contact with the collected sample.

Part 4. Equipment Installation. Provide a step-by-step description of the procedure used for installing soil-pore liquid monitoring devices.

Part 5. Sampling Procedures. Explain in a step-by-step fashion how samples of soil-pore liquid and soil will be obtained using the equipment described above. Include a description of sample collection, preparation, preservation, and transport procedures. Also, include the number of samples taken at each sampling event, as well as compositing procedures, if used.

Part 6. Analytical Procedures. Specify which analytical procedure will be used to determine the concentration of each hazardous constituent in collected samples and the name of the laboratory that will perform the analyses.

Part 7. Chain of-Custody Control. Explain in a step-by-step fashion the plan for maintaining chain of custody control throughout sampling, transportation, analysis, and reporting.

Part 8. Background. Describe in detail the procedures for determining both soil background and soil-pore liquid background values. Include the location and depth of background samples, sampling procedures, analytical methods, and results.

Part 9. Statistical Methods. Describe the statistical methods that will be used to determine a significant difference between background sample concentrations and monitoring sample concentrations for both soil and soil-pore liquids. Include the rationale for developing the statistical methods to be used with respect to the effectiveness of the method for determining real differences between background and monitoring results.

Section 264.278(f)(3) requires that the permittee determine within a reasonable time period if monitoring results show a significant increase over background values. Submit an estimate of the amount of time in days that would be needed after sampling to analyze samples, obtain test results, and make a determination of whether a significant increase has occurred.

If the applicant desires to monitor only principal hazardous constituents (PHCs) instead of all hazardous constituents list the proposed PHCs. Submit an explanation with supporting data to justify monitoring for PHCs in lieu of all hazardous constituents listed in Section 7.4.3.1. The explanation must demonstrate that the selected PHCs meet the criteria set forth in §264.278(a)(2). Methods for selecting PHCs are discussed in RCRA Guidance Document: Land Treatment Units (2).

7.4.3.7 Treatment Zone Description --

Describe the proposed treatment zone and soils that occur in the land treatment unit that will comprise the treatment zone. The description should include the information described below.

Part 1. Soil Survey. Submit a map or plot plan of the land treatment unit which delineates the horizontal boundaries of the treatment zone and all of the soil series that occur therein. Current soil survey information may be obtained from local offices of the U.S. Department of Agriculture, Soil Conservation Service. Label the soil series identified on the map and include the location of soil samples as required below.

Part 2. Series Descriptions. Submit a description of ea soil series identified within the treatment zone. For native soils that have not received waste applications, soil series designations prepared by the Soil Conservation Service are suitable, provided the soil sampling and analysis (Part 3 below) confirms these designations. For severely disturbed soils, fill materials, or soils that may have received previous applications of waste, a new series description closely paralleling those prepared by the Soil Conservation Service should always be prepared on the basis of the soil sampling described in Part 3 below and additional observations by a qualified soil scientist.

Series descriptions should include the following information:

- Profile description with horizonation, depth, color, USDA texture, structure, reaction (an estimate of pH), and thickness; - Physical setting with slope and annual climatic data;
- Mineralogy;
- Use and vegetation; and
- Estimated soil properties including:
    - USDA texture
    - Atterburg limits
    - permeability
    - available water capacity
    - pH
    - salinity
    - shrink-swell potential
    - erosion factors
    - flood frequency and duration
    - depth of seasonal high ground water table
    - frost action potential.

Part 3. Results of Soil Sampling and Analysis. Submit the methods and results of soil sampling and analysis within the treatment zone. Show the location of soil samples on the soil survey map or plot plan prepared for Part 1 above. Describe methods of sample collection, sample preparation, and analytical methods. Recommended sampling methods and analytical procedures are discussed in *Hazardous Waste Land Treatment* (1) and *Methods of*

Soil Analysis (4). Tabulate the results of soil sampling and analysis for at least the parameters listed in Table 7-9. Include a separate table for each soil series and follow the format of Table 7-9.

Part 4. Depth of Treatment Zone. Specify the vertical dimensions of the treatment zone in meters below the initial soil surface and meters above the seasonal high water table.

7.5 DESIGN, CONSTRUCTION, OPERATION, AND MAINTENANCE

7.5.1 Federal Requirement

Section 270.20(c) states that the Part B application must include:

> (c) A description of how the unit is or will be designed, constructed, operated, and maintained in order to meet the requirements of §264.273. This submission must address the following items:
>
> (1) Control of run-on;
>
> (2) Collection and control of run-off;
>
> (3) Minimization of run-off of hazardous constituents from the treatment zone;
>
> (4) Management of collection and holding facilities associated with run-on and run-off control systems;
>
> (5) Periodic inspection of the unit. This information should be included in the inspection plan submitted under 270.14(b)(5);
>
> (6) Control of wind dispersal of particulate matter, if applicable;

The applicable Part 264 standards are contained in §264.273(b) through (g) which state:

> (b) The owner or operator must design, construct, operate, and maintain the treatment zone to minimize run-off of hazardous constituents during the active life of the land treatment unit.

TABLE 7-9. FORMAT FOR REPORTING THE RESULTS OF SOIL SAMPLING AND ANALYSIS

Series Name: ______________________ Date of Sampling: ______________________

Horizon	Parameters	Analytical Methods*	Value		Units
A (0-X cm)	pH	1:1 Glass Electrode		____	Standard pH Units
	Particle Size Distribution	Hydrometer Method	Sand	____	Dry Weight %
			Silt	____	Dry Weight %
			Clay	____	Weight %
	Electrical Conductivity	Saturated Paste Extract - Wheatstone Bridge		____	mmhos/cm
	Total Organic Carbon	Dichromate Wet Oxidation Method		____	Dry Weight %
	Cation Exchange Capacity	Ammonium Saturation Method		____	meq/100 g soil
	Lime Requirement of pH = 6.5	$BaCl_2$ TEA Method		____	meq/100 g
B (X-Y cm)	pH	1:1 Glass Electrode		____	Standard pH Un
	Particle Size Distribution	Hydrometer Method	Sand	____	Weight %
			Silt	____	Weight %
			Clay	____	Weight %
	Cation Exchange Capacity	Ammonium Saturation Method		____	meq/100 g soil
	Electrical Conductivity	Saturated Paste Method Wheatstone Bridge		____	mmhos/cm
	Total Organic Carbon	Dichromate Wet Oxidation Methods		____	Dry Weight %
C (Y-Z cm)	pH	1:1 Glass Electrode			Standard pH Units
	Particle Size Distribution	Hydrometer Method	Sand	____	Weight %
			Silt	____	Weight %
			Clay	____	Weight %

---

* thods for soil analysis are discussed in *Hazardous Waste Land Treatment* (1) and *Methods of Soil*

(c) The owner or operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the treatment zone during peak discharge from at least a 25-year storm.

(d) The owner or operator must design, construct, operate, and maintain a run-off management system to collect and control at least the water volume resulting from a 24-hour, 25-year storm.

(e) Collection and holding facilities (e.g., tanks or basins) associated with run-on and run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain the design capacity of the system.

(f) If the treatment zone contains particulate matter which may be subject to wind dispersal, the owner or operator must manage the unit to control wind dispersal.

(g) The owner or operator must inspect the unit weekly and after storms to detect evidence of:

(1) Deterioration, malfunctions, or improper operation of run-on and run-off control systems; and

(2) Improper functioning of wind dispersal control measures.

7.5.2 Guidance in Achieving the Part 264 Standard

Section 264.273(b) through (g) contain requirements related to (1) minimizing run-off of hazardous constituents, (2) controlling surface water (run-on and run-off), (3) managing run-on and run-off control systems, (4) controlling wind dispersal, and (5) inspecting run-on, run-off, and wind dispersal control systems.

Specific guidance related to minimizing run-off of hazardous constituents is provided in RCRA Guidance Document: Land Treatment Units (2). Generally, the owner or operator should closely evaluate treatment zone characteristics, particularly infiltration properties, slope, and moisture conditions, and modify design and operating practices to optimize treatment and minimize run-off. Additional design measures such as a vegetative cover are often beneficial.

Information on design and management of run-on and run-off control systems is provided in Hazardous Waste Land Treatment (1). This document and the RCRA Guidance Document: Land Treatment Units (2) discuss approaches for managing collected run-off. Run-off from hazardous waste management units is not specifically listed as a hazardous waste. However, if the run-off is a hazardous waste according to the characteristics defined in Part 261 it must be managed as a hazardous waste. Also, if the run-off contains leachate (a hazardous waste), it is automatically considered a hazardous waste. "Leachate" is defined in §260.10 as any liquid, including any suspended components in the liquid, that has percolated through or drained from hazardous waste. As provided in §261.3, leachate is a hazardous waste. The Agency will assume that active area run-off contains leachate (because of direct contact with wastes) unless it is demonstrated otherwise.

Run-off from the active area of land treatment units is considered to be a hazardous waste unless the permittee can demonstrat that it is only precipitation run-off. Thus equipment and faciliti used to collect, treat, store, and/or dispose of this run-off (and any other run-off shown to be hazardous) must meet applicable Part 264 standards (Subpart K for surface impoundments and Subpart J for tanks).

Run-off from undeveloped portions of a facility, and from areas that are not part of the land treatment unit need not be collected pursuant to §§264.251(d), 264.273(d), and 264.301(d). These portions include roadways and buildings.

Wind dispersal control measures include surface wetting (irrigation) with water or chemical agents, establishment of a vegetative cover, natural or manmade windbreaks, and waste application timing. The effectiveness of these measures varies depending on numerous site-specific factors. Often a combination of these measures will be necessary to obtain effective wind dispersal control. See RCRA Guidance Document: Land Treatment Units (2) and Hazardous Waste Land Treatment (1) for additional information on wind dispersal controls.

7.5.3 Guidance on Addressing the Application Information Requirement

A suggested attachment to the permit application is Design, Construction, Operation and Maintenance Plan. This should include the following.

7.5.3.1 Surface Water Control Plans --

The applicant should submit a scale drawing of the land treatment unit indicating the location of surface water control structures and/or soil erosion control structures (such as terraces, dikes, ponds, culverts, ditches, and canals) that will be used to control run-on and run-off. For each structure, include a typical cross section indicating elevation, inclination of slopes, construction material specifications, and construction methods. Also, include design calculations for sizing surface water control structures based on storm frequency, duration, and intensity.

7.5.3.2 Minimizing Run-off of Hazardous Constituents --

The applicant should identify specific measures that will be implemented at the land treatment unit to minimize the concentration of hazardous constituents in surface water run-off from the treatment zone.

7.5.3.3 Management of Accumulated Run-off and Run-on --

The applicant should submit a monthly tabulation of run-off (and run-on) storage requirements followed by a brief explanation of how the collected liquid will be managed for disposal. Include methods for draining storage basins and disposing accumulated stormwater, such as treatment and discharge, evaporation ponds, spray irrigation, etc. If collected liquid is to be managed as a nonhazardous waste, provide data showing that liquid is not a hazardous waste according to criteria in Part 261 of the hazardous waste regulations.

7.5.3.4 Control of Wind Dispersal --

The applicant should submit a wind erosion control plan designed to minimize the wind dispersal of soil, soil-waste mixture, or waste particulate matter. Describe in detail specific measures for controlling wind erosion such as windbreaks, vegetative cover, soil stabilization, and/or irrigation. Include any data supporting the effectiveness of the proposed measure(s) at the land treatment unit.

7.5.3.5 Inspection of Land Treatment Unit --

Submit a schedule for periodic inspections of the land treatment unit to determine the adequacy of surface water control and wind erosion control measures. Also, include the name or title of the person(s) responsible for conducting inspections, a list of items to be inspected, procedures for responding to observed inadequacies, and records for inspection results.

7.6 FOOD-CHAIN CROPS

7.6.1 Federal Requirement

Section 270.20(d)(1 through 5) states:

> (d) If food-chain crops are to be grown in or on the treatment zone of the land treatment unit, a description of how the demonstration required under §264.276(a) will be conducted including:
>
> (1) Characteristics of the food-chain crop for which the demonstration will be made;
>
> (2) Characteristics of the waste, treatment zone, and waste application method and rate to be used in the demonstration;
>
> (3) Procedures for crop growth, sample collection, sample analysis, and data evaluation;
>
> (4) Characteristics of the comparison crop including the location and conditions under which it was or will be grown.
>
> (5) If food-chain crops are to be grown, and cadmium is present in the land-treated waste; a description of how the requirements of §264.276(b) will be complied with.

The corresponding Part 264 technical standard is contained in §264.276 which states:

> The Regional Administrator may allow the growth of food-chain crops in or on the treatment zone only if the owner or operator satisfies the conditions of this section. The Regional Administrator will specify in the facility permit the specific food-chain crops which may be grown.
>
> (a)(1) The owner or operator must demonstrate that there is no substantial risk to human health caused by the growth of such crops in or on the treatment zone by demonstrating, prior to the planting of such crops, that hazardous constituents other than cadmium:

(i) Will not be transferred to the food or feed portions of the crop by plant uptake or direct contact, and will not otherwise be ingested by food-chain animals (e.g., by grazing); or

(ii) Will not occur in greater concentrations in or on the food or feed portions of crops grown on the treatment zone than in or on identical portions of the same crops grown on untreated soils under similar conditions in the same region.

(2) The owner or operator must make the demonstration required under this paragraph prior to the planting of crops at the facility for all constituents identified in Appendix VIII of Part 261 of this chapter that are reasonably expected to be in, or derived from, waste placed in or on the treatment zone.

(3) In making a demonstration under this paragraph, the owner or operator may use field tests, greenhouse studies, available data, or, in the case of existing units, operating data, and must:

(i) Base the demonstration on conditions similar to those present in the treatment zone, including soil characteristics (e.g., pH, cation exchange capacity), specific wastes, application rates, application methods, and crops to be grown; and

(ii) Describe the procedures used in conducting any tests, including the sample selection criteria, sample size, analytical methods, and statistical procedures.

(4) If the owner or operator intends to conduct field tests or greenhouse studies in order to make the demonstration required under this paragraph, he must obtain a permit for conducting such activities.

(b) The owner or operator must comply with the following conditions if cadmium is contained in wastes applied to the treatment zone:

(1)(i) The pH of the waste and soil mixture must be 6.5 or greater at the time of each waste application, except for waste containing cadmium at concentrations of 2 mg/kg (dry weight) or less;

(ii) The annual application of cadmium from waste must not exceed 0.5 kg/ha (0.45 lb/a) on land used for production of tobacco, leafy vegetables, or root crops grown for human consumption. For other food-chain crops, the annual cadmium application rate must not exceed the rates shown in Table 7-10.

Table 7-10. ALLOWABLE ANNUAL CADMIUM LOADING RATES

Time Period	Annual Cd application rate (kilograms per hectare)
Present to June 30, 1984	2.0 (1.8 lb/a)
July 1, 1984 to Dec. 1986	1.25 (1.1 lb/a)
Beginning Jan. 1, 1987	0.5 (0.45 lb/a)

(iii) The cumulative application of cadmium from waste must not exceed 5 kg/ha (4.4 lb/a) if the waste and soil mixture has a pH of less than 6.5; and

(iv) If the waste and soil mixture has a pH of 6.5 or greater or is maintained at a pH of 6.5 or greater during crop · growth, the cumulative application of cadmium from waste must not exceed the following:

Cumulative Application	Cation Exchange Capacity of Soil
5 kg/ha (4.5 lb/a)	5 meq/100g
10 kg/ha (9 lb/a)	5 - 15 meg/100g
20 kg/ha (18 lb/a)	> 15 meg/100g

(2)(i) Animal feed must be the only food-chain crop produced;

(ii) The pH of the waste and soil mixture must be 6.5 or greater at the time the crop is planted, whichever occurs later, and this pH level must be maintained whenever food-chain crops are grown;

(iii) There must be an operating plan which demonstrates how the animal feed will be distributed to preclude ingestion by humans. The operating plan must describe the measures to be taken to safeguard against possible health hazards from cadmium entering the food chain, which may result fror alternative land uses; and

(iv) Future property owners must be notified by a stipulation in the land record or property deed which states that the property has received waste at high cadmium application rates and that food-chain crops must not be grown except in compliance with paragraph (b)(2) of this section.

7.6.2 Guidance on Achieving the Part 264 Standard

If food chain crops will be grown on the treatment zone, §264.276 requires that the permittee demonstrate that there is no substantial risk to human health caused by the growth of such crops in or on the treatment zone. The permittee may make the demonstration in one of two ways: (1) demonstrate that hazardous constituents will not be transferred to food or feed portions of the crop, and will not otherwise be ingested by food chain animals, or (2) demonstrate that hazardous constituents will not occur in greater concentrations in or on the food or feed portions of crops grown on the treatment zone than in or on identical crops grown on untreated soils under similar conditions in the same region. In the second option, "in or on the crops" includes the potential contamination pathway of soil adherence to crops and ingestion by grazing animals. Both demonstration options require the permittee to address all potential food chain contamination pathways including crop uptake, physical adherence to crop, and direct ingestion of contaminated soil by grazing animals. The second option, however, allows one to demonstrate that the uptake of a given hazardous constituent by a food chain crop will not exceed acceptable concentrations (i.e., greater than identical crops grown on untreated soil under similar conditions in the same region). The first option requires the demonstration of transfer of the hazardous constituents to food or feed portions of the crop. While demonstrating no transfer of hazardous constituents may seem burdensome, it may be the preferred demonstration approach in cases where the hazardous constituent is preferentially excluded from the food or feed portions of the crop.

In making either of the above demonstrations, the owner or operator may use field tests, greenhouse studies, available data, or, in the case of existing units, operating data. The second demonstration option described above, however, will in most cases require field testing or operating data. Management methods used in the test must simulate actual operating conditions such as waste application rates, waste application scheduling, waste application techniques, fertilizer applications, irrigation, and crop harvesting techniques. Tests should be designed to identify and differentiate between crop contamination caused by root or foliar uptake and contamination resulting from external sources such as dispersal of contaminated soil during mechanical harvesting. Further discussion on design of field tests is included in Hazardous-Waste Land Treatment (1). For guidance on design of greenhouse studies, the applicant is also referred to Greenhouse Techniques for Soil-Plant-Fertilizer Research (5). In designing either greenhouse or field plant uptake studies, a qualified agronomist should be consulted.

Section 264.276 also contains requirements pertaining to situations in which cadmium is contained in wastes applied to treatment zone when food chain crops are grown. These standards may be met through strict adherence to the cadmium application limits and careful control of treatment zone conditions (i.e., soil pH).

7.6.3 Guidance in Addressing the Application Information Requirement

A suggested attachment to the permit application is Food Chain Crop Demonstration Plan. It should contain the following.

7.6.3.1 Food Chain Crop Demonstration --

The Part B permit application must include a description of how this demonstration will be made using available data, greenhouse tests, field tests operating data.

Part 1. If existing literature or previous studies will be used in the food chain crop demonstration, describe or identify the literature or previous studies and how the data obtained from these sources will be used in the demonstration.

Part 2. (Existing land treatment units only.) If previous operating data will be used in the food chain crop demonstration, describe the data, the source of the data, how it was obtained, and how it will be used to make the food chain crop demonstration.

Part 3. If greenhouse tests will be used in the demonstration submit a description of the test including the following information as described below.

- Crop characteristics. Identify the crop or crops to be grown with both the common and scientific name. Describe the potential food or feed portions of the crop.
- Waste characteristics. Identify hazardous constituents in the waste and their respective concentration, if not previously submitted.
- Assessment of potential crop uptake. Explain how the potential for crop uptake will be assessed and describe proposed test procedures in detail including the following information:

test location;
test schedule;
number and size of plots or containers;
number of treatment replications;
number of treatments;
rate of waste application;
soil characteristics;
soil preparation;
sampling and sample preparation methods;
analytical methods;
data interpretation methods; and
method of data presentation

- Potential for external contamination. Explain how external contamination of the food or feed portion of the crop will be precluded and how this will be substantiated in the demonstration.

- Potential for ingestion by food chain animals. Explain how food chain animals will be prevented from ingesting hazardous constituents and how this will be substantiated in the demonstration.

Part 4. If field tests will be used in the food chain crop demonstration, describe how each test will be designed and conducted including the information as decribed below.

- Plot configuration. Show the layout, location, and dimensions of test plots on a scale drawing. Include site characteristics such as surface waters, structures, and property lines.

- Crop characteristics. Identify the species and variety of the crop, the edible portion of the crop, and previous information concerning plant uptake of the hazardous constituents present in the waste by the crop beng tested or by similar crops.

- Waste characteristics. Describe the concentration of hazardous constituents in the waste, the volatility and water solubility of the hazardous constituents, and the persistence of these constituents in soil.

- Treatment zone characteristics. Evaluate soil properties that will affect plant uptake of hazardous constituents including soil pH, soil organic matter content, soil texture, and cation exchange capacity.

- Waste application rate and application method. Describe methods that will be used during land treatment operations and methods used in the demonstration.

- Sample collection procedures. Describe sampling methods including harvest or sample collection, method of collection, quantity of sample collected, methods for obtaining representative samples, and sample preservation and transport.

- Analytical procedures. Explain in detail or cite methods for analytical methods, chain of custody control, and expected detection levels of the constituents being analyzed.

- Data evaluation methods. Explain statistical methods and presentation of results. Data evaluation should include factors to be assessed such as dilution effects due to growth, variability between individual plants, variability between waste application rates, biomagnification through plant uptake, quantity taken up by crops, persistence of hazardous constituents in crop tissues, and the concentration of hazardous constituents in the edible portion.

7.6.3.2 Wastes Containing Cadmium --

Part 1. If cadmium is contained in the wastes to be land treated on units growing food chain crops the applicant must specify the concentration of cadmium in such wastes, the annual waste application rates for cadmium containing wastes, and the soil loading of cadmium resulting from the waste application rates to be used. Use the example format in Table 7-10 and include all calculations.

TABLE 7-11. EXAMPLE CADMIUM LOADING RATE TABLE

Waste Name and EPA ID No.	Cd in Waste (mg/kg)	Annual Waste Application Rate (kg/ha)	Annual Cadmium Loading (kg/ha)
1.			
2.			
3.			

Part 2. If animal feed is the only food chain crop produced, the applicant should submit the following:

- Species and variety of crop produced;
- Initial or native soil pH;
- Methods and frequency of soil pH adjustment (if necessary);
- An operating plan for preventing direct human consumption of produced animal feed and a plan to safeguard against cadmium entering the human food chain resulting from future alternative land use; and
- Proof that the deed records stipulate the land has received elevated applications of cadmium and that food chain crops should not be grown except in accordance with §264.276(b)(2).

If animal feed will not be the only food chain crop produced, submit the following:

- The species and variety of crop produced;
- Initial or native soil pH;
- Methods and frequency for adjusting soil pH (if necessary); and
- An operating plan for controlling applications of cadmium to the soil.

7.7 ESTABLISHMENT OF VEGETATIVE COVER AT CLOSURE

7.7.1 Federal Requirement

Section 270.20(d)(6) requires the Part B application to include (as part of the facility closure plan):

> (6) A description of the vegetative cover to be applied to closed portions of the facility, and a plan for maintaining such cover during the post-closure care period, as required under §264.280(a)(8) and §264.280(c)(2). This information should be included in the closure plan and, where applicable, the post-closure care plan submitted under !270.14(b)(13);

Section 264.280(a)(8) requires the permittee, as part of closure, to:

> (8) Establish a vegetative cover on the portion of the facility being closed at such time that the cover will not substantially impede degradation, transformation, or immobilization of hazardous constituents in the treatment zone. The vegetative cover must be capable of maintaining growth without extensive maintenance.

Section 264.28i(c)(2) states that during the post closure care period the permittee must:

> (2) maintain a vegetative cover over closed portions of the facility.

7.7.2 Guidance on Achieving the Part 264 Standard

Guidance on when to establish a vegetative cover during the closure period is provided in RCRA Guidance Document: Land Treatment Units (2). The U. S. Soil Conservation Service publishes information on the adaptability of major crops to certain regional climates and conditions, and the technical resource document, Hazardous Waste Land Treatment (1), provides information on crops suitable for revegetating waste amended soils. Other appropriate sources of information are referenced elsewhere (2).

7.7.3 Guidance on Addressing the Permit Application Information Requirement

A suggested attachments to the permit application is Closure Plan and Post-Closure Care Plan. The applicant should submit a written description of procedures that will be used to establish and maintain a vegetative cover on closed portions of the land treatment unit. The description should, at a minimum, include the following information:

- Common name, species, and variety of the cover crop to be established;

- Data or information demonstrating that the crop can thrive and is adapted to the region in which the unit is located; and

- A description of the planting technique and necessary maintenance activities (e.g., fertilization, irrigation); and

- The minimum percentage of soil cover that will be maintained on the closed land treatment unit. Describe the method that will be used to measure the amount of soil coverage.

7.8 IGNITABLE OR REACTIVE WASTES

7.8.1 Federal Requirement

Section 270.20(d)(7) states:

(7) If ignitable or reactive wastes will be placed in or on the treatment zone, an explanation of how the requirements of §264.281 will be complied with.

Section 264.281 states that the permittee must not apply

ignitable or reactive waste unless:

(a) The waste is immediately incorporated into the soil so that:

(1) The resulting waste, mixture, or dissolution of material no longer meets the definition of ignitable or reactive waste under §§261.21 or 261.23 of this chapter; and

(2) Section 264.17(b) is complied with; or

(b) The waste is managed in such a way that it is protected from any material or conditions which may cause it to ignite or react.

Section 261.21 states:

(a) A solid waste exhibits the characteristic of ignitability if a representative sample of the waste has any of the following properties:

(1) It is a liquid, other than an aqueous solution containing less than 24 percent alcohol by volume, and has a flash

point less than 60° C (140° F), as determined by a Pensky-Martens Closed Cup Tester, using the test method specified in ASTM Standard D-93-79, or a Setaflash Closed Cup Tester, using the test method specified in ASTM standard D-3278-78, or as determined by an equivalent test method approved by the Administrator under the procedures set forth in (§260.20 and 260.21.

(2) It is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.

(3) It is an ignitable compressed gas as defined in 49 CFR 173.300 and as determined in that regulation or equivalent test methods approved by the Administrator under

§§ 260.20 and 260.24.
(4) It is an oxidizer as defined in 49 CFR 173.151.

(b) A solid waste that exhibits the characteristic of ignitability, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste number of D001. Section 261.23 states:

(a) A solid waste exhibits the characteristic of reactivity if a representative sample of the waste has any of the following properties:

(1) It is normally unstable and readily undergoes violent change without detonating.

(2) It reacts violently with water.

(3) It forms potentially explosive mixtures with water.

(4) When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.

(5) It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.

(6) It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.

(7) It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

(8) It is a forbidden explosive as defined in 49 CFR 173.51, or a Class A explosive as defined in 49 of §173.53 or a Class B explosive as defined in 49 CFR 173.88.

(b) A solid waste that exhibits the characteristic of reactivity, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste Number of D003.

7.8.2 Guidance on Achieving the Part 264 Standard

Limited information is available on the land treatment of specific ignitable or reactive wastes. The applicant should thoroughly evaluate the best design and operating procedures in the treatment demonstration. Section 264.281 requires that the waste be either immediately incorporated into the soils so that the waste is rendered nonignitable or nonreactive and §264.17(b) is compiled with, or the waste is managed in such a way that is protected from any material or conditions that may cause it to ignite or react. The Agency recommends, as part of the management procedures, that the waste be applied using subsurface injection and/or it is premixed with soil. Appropriate safety measures should be followed at all times. The applicant should consult Hazardous Waste Land Treatment (1) for additional information.

7.8.3 Guidance on Addressing the Permit Application Information Requirement

If ignitable or reactive wastes will be placed in or on the treatment zone, the applicant should submit a detailed written plan for managing such wastes. A suggested attachment to the permit application is Ignitable and/or Reactive Waste Management Plan. The plan should include:

- Name of the waste and chemical composition;

- Results of laboratory or field experiments which demonstrate that when the waste is incorporated into the soil of the treatment zone, the resulting mixture is no longer ignitable or reactive;

- Provisions for immediate incorporation of the waste into the soil of the treatment zone (e.g., subsurface injection); and

- Handling procedures and safety precautions for preventing conditions that may cause the waste to ignite or react.

7.9 INCOMPATIBLE WASTES

7.9.1 Federal Requirement

Section 270.20(d)(8) states:

(8) If incompatible wastes, or incompatible wastes and materials, will be placed in or on the same treatment zone, an explanation of how §264.282 will be complied with.

Section 264.282 states that:

> The owner or operator must not place incompatible wastes and materials (see Appendix V of this part for examples), in or on the same treatment zone, unless §264.17(b) is complied with.

Section 264.17(b) states:

(b) Where specifically required by other Sections of this Part, the owner or operator of a facility that treats, stores or disposes ignitable or reactive waste, or mixes incompatible waste or incompatible wastes and other materials, must take precautions to prevent reactions which:

(1) Generate extreme heat or pressure, fire or explosions, or violent reactions;

(2) Produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment;

(3) Produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions;

(4) Damage the structural integrity of the device or facility;

(5) Through other like means threaten human health or the environment.

7.9.2 Guidance on Achieving the Part 264 Standard

Information on incompatible wastes and guidance on achieving the standards specified in §264.282 is available in Hazardous Waste Land Treatment (2) and Appendix V of the Part 264 regulations. The data shown from Appendix V, below, are a useful guide for predicting possible reactions resulting from mixing wastes, but this information does not necessarily apply to such mixtures within the soil matrix. Also, this information does not address the issues of constituent concentrations or of the heterogeneity or complexity of most waste streams. Lab and field testing (to be completed with the treatment demonstration) may be needed when knowledge about possible reactions resulting from mixing particular waste streams is insufficient.

Appendix V of Part 264 states:

> Many hazardous wastes, when mixed with other waste or materials at a hazardous waste facility, can produce effects which are harmful to human health and the environment, such as (1) heat or pressure, (2) fire or explosion, (3) violent reaction, (4) toxic dusts, mists, fumes, or gases, or (5) flammable fumes or gases.
>
> Below are examples of potentially incompatible wastes, waste components, and materials, along with the harmful consequences which result from mixing materials in one group with materials in another group. The list is intended as a guide to permittees of treatment, storage, and disposal facilities, and to enforcement and permit granting officials, to indicate the need for special precautions when managing these potentially incompatible waste materials or components.

This list is not intended to be exhaustive. A permittee must, as the regulations require, adequately analyze this to avoid creating uncontrolled substances or reactions of the type listed below, whether they are listed below or not.

It is possible for potentially incompatible wastes to be mixed in a way that precludes a reaction (e.g., adding acid to water rather than water to acid) or that neutralizes them (e.g., a strong acid mixed with a strong base), or that controls substances produced (e.g., by generating flammable gases in a closed tank equipped so that ignition cannot occur, and burning the gases in an incinerator). An applicant should consider these as potential aspects of the overall operating plan, facility design, and permit application.

In the lists below, the mixing of a Group A material with a Group B material may have the potential consequence noted.

Group 1-A

Acetylene sludge
Alkaline caustic liquids
Alkaline cleaner
Alkaline corrosive liquids
Alkaline corrosive battery fluid
Caustic wastewater
Lime sludge and other corrosive alkalies
Lime wastewater
Lime and water
Spent caustic

Group 1-B

Acid sludge
Acid and water
Battery acid
Chemical cleaners
Electrolyte, acid
Etching acid liquid or solvent
Pickling liquor and other corrosive acids
Spent acid
Spent mixed acid
Spent sulfuric acid

Potential consequences: Heat generation; violent reaction.

Group 2-A

Aluminum
Beryllium
Calcium
Lithium
Magnesium
Potassium
Sodium
Zinc powder
Other reactive metals and metal hydrides

Group 2-B

Any waste in Group 1-A or 1-B

Potential consequences: Fire or explosion; generation of flammable hydrogen gas.

Group 3-A

Alcohols
Water

Group 3-B

Any concentrated waste in Groups 1-A or 1-B
Calcium
Lithium
Metal hydrides
Potassium
SO_2Cl_2, $SOCl_2$, PCl_3, CH_3SiCl_3
Other water-reactive waste

Potential consequences: Fire, explosion, or heat generation; generation of flammable or toxic gases.

Group 4-A

Alcohols
Aldehydes
Halogenated hydrocarbons
Nitrated hydrocarbons
Unsaturated hydrocarbons
Other reactive organic compounds and solvents

Group 4-B

Concentrated Group 1-A or 1-B wastes
Group 2-A wastes

Potential consequences: Fire, explosion, or violent reaction.

Group 5-A

Spent cyanide and sulfide solutions

Group 5-B

Group 1-B wastes

Potential consequences: Generation of toxic hydrogen cyanide or hydrogen sulfide gas.

Group 6-A

Chlorates
Chlorine
Chlorites
Chromic acid
Hypochlorites
Nitrates
Nitric acid, fuming
Perchlorates
Permanganates
Peroxides
Other strong acidizers

Group 6-B

Acetic acid and other organic acids
Concentrated mineral acids
Group 2-A wastes
Group 4-A wastes
Other flammable and combustible wastes

Potential consequences: Fire, explosion, or other violent reactions.

7.9.3 Guidance on Addressing the Permit Application Information Requirement

If incompatible wastes and materials will be placed in or on the same treatment zone, the applicant must submit a written plan that explains procedures and precautions for handling such waste. A suggested attachment to the permit application is Management Plan for Incompatible wastes. The plan must contain the following information:

- Name of incompatible materials or wastes;
- Explanation of incompatibility;
- Composition of incompatible materials and waste;
- Rate and schedule of incompatible waste or material applications to the treatment zone;
- Step-by-step procedures for managing incompatible wastes or materials to prevent undesirable reactions or effects; and
- Laboratory or field data demonstrating that incompatible wastes can be safely managed at the land treatment unit using the proposed procedures.

7.10 REFERENCES

1. K.W. Brown and Associates. Hazardous Waste Land Treatment. SW-874, College Station, TX. GPO Stock No. 055-000-00232-1.

2. U. S. Environmental Protection Agency. RCRA Guidance Document: Land Treatment Units. U. S. EPA Office of Solid Waste, Washington, D. C., 1983.

3. U. S. Environmental Protection Agency. Test Methods for Evaluating Solid Waste. SW-846, Washington, D.C., 1982. GPO Stock No. 055-002-81001-21.

4. Black, A. C. ed. Methods of Soil Analysis. Agronomy 9. American Society of Agronomy, Madison, WI, 1965. 2 volumes.

5. Allen, S. E., G. L. Terman, and L. B. Clemens. Greenhouse Techniques for Soil-Plant-Fertilizer Research. Bulletin Y-114, National Fertilizer Development Center, Muscle Shoals, Alabama, 1976.

7.11 CHECKLIST

Table 7-12 is a checklist of permit application requirements for land treatment units. The requirements for both new and existing units are included. The applicant is encouraged to use the checklist and to incorporate it into the permit application. The checklist identifies the application requirements and provides references to Parts 264 and 270. The applicant should identify the location in the application of the material addressing each requirement. Space is provided for this. This will help ensure that the application is complete. As noted in Section 4.0, it is suggested that a copy of this checklist be included as part of the permit application to aid reviewers. Reviewers, then, will be able to more readily locate specific aspects of the application, and communications between reviews and applicants will be facilitated.

Definitions of terms used in the checklist are provided below. Checklist footnotes are explained on the last page of the checklist. An "existing land treatment unit" is a unit that was in operation or for which construction had commenced before issuance of the final (Part B) permit and has or will receive hazardous wastes after January 26, 1983.

A "new unit" is one for which construction does not commence until after issuance of the final (Part B) permit.

An "X" in the checklist indicates that the applicant for that typ of unit must address the specific item or an equivalent optional item (if available) in the permit application.

An "O" in the checklist indicates that the item is optional in the permit application. Response to an optional item may eliminate the necessity of responding to certain items that might otherwise be required.

A blank space in the checklist means that either the subject requirement is general and serves as a heading for subordinates listed below it, or that the subject requirement does not apply to that type of management unit.

TABLE 7-12

PERMIT APPLICATION CHECKLIST FOR LAND TREATMENT

Page 1

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
270.14(b)		Part B General Information Requirements				
270.14(b)(1)		- General description of the facility	X	X		
270.14(b)(2)	264.13(a)	- Chemical and physical analysis of hazardous wastes to be handled	X	X		
270.14(b)(3)		- Waste analysis plan				
	264.13(b)(1) through (5)	- Analysis parameters with rationale	X	X		
		- Test methods for analyzing parameters	X	X		
		- Procedure for collecting representative samples	X	X		
		- Frequency of analyses	X	X		
		- List and description of waste analyses to be generator supplied	X	X		
	264.13(b)(6) and 264.17(c)	- Waste analysis procedures for ignitable, reactive, incompatible wastes	X	X		
	264.13(c)	- For off-site facilities, procedures to identify each waste movement, and	X	X		
		- Procedures for collecting representative samples	X	X		
270.14(b)(4)		- Security description for active portion of facility				
	264.14(a)	- Security procedures waiver justification	0	0		
		- Unknowing/unauthorized contact with waste not harmful	0	0		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Unknowing/unauthorized disturbance of waste or equipment cannot cause violation of Part 264	0	0		
	264.14(b)	- Description of 24-hour surveillance system, or	X	X		
		- Description of artificial or natural barriers, and	X	X		
		- Description of controlled entry/egress procedures, and	X	X		
	264.14(c)	- Description of warning signs	X	X		
		- List of languages on signs	X	X		
		- Statement of 25-foot legibility	X	X		
		- Description of sign locations and numbers of signs	X	X		
270.14(b)(5)		- General Inspection Schedule and Procedures Description	X	X		
	264.15(b)(1)	- Written schedule	X	X		
	264.15(b)(2) and 265.15(d)	- Statement as to where, at facility, inspection schedule and inspection records will be kept	X	X		
	264.15(b)(1)	- Identification of equipment/processes to be inspected	X	X		
	264.15(b)(3)	- Identification of types of problems each equipment/process to be checked for	X	X		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
	264.15(b)(4)	- Frequency of inspections by equipment/process	X	X		
	264.15(c)	- Schedule of remedial action	X	X		
270.14(b)(6)	Part 264 Subpart C	- Preparedness and Prevention Documentation				
		- Waiver(s) request and justification	0	0		
	264.32(a)	- Description of internal communications/alarm system(s)	X	X		
	264.34(a)	- Documentation of personnel access to internal communication/alarm system(s)	X	X		
	264.32(b)	- Description of external communications/alarm system(s)	X	X		
	264.34(b)	- Documentation of personnel access to external communications/alarm system(s)	X	X		
	264.32(c)	- Description of fire control/extinguishing, spill control, and decontamination equipment	X	X		
	264.32(d)	- Documentation of adequate water volume and pressure for above equipment	X	X		
	264.33	- Documentation of equipment testing/maintenance schedule and procedures	X	X		
	264.35	- Documentation of adequate aisle space	X	X		
	264.37 (also 264.52(c))	- Documentation and descriptions of arrangements or attempts at arrangements with:	X	X		
		- Police department(s)	X	X		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Fire department(s)	X	X		
		- Hospitals	X	X		
		- Local emergency response teams	X	X		
		- State emergency response teams	X	X		
		- Emergency response contractors	X	X		
		- Equipment suppliers	X	X		
	264.37(a)(2)	- Documentation of agreements designating primary emergency authority	X	X		
270.14(b)(7)	Part 264 Subpart D	- Contingency Plan Documentation				
	264.51 and 264.52(a)	- Criteria for implementation of contingency plan	X	X		
	264.52(d)	- Emergency Coordinators Identification				
		- Names	X	X		
		- Addresses	X	X		
		- Home/Work Phones	X	X		
	264.55	- Documentation of Qualifications	X	X		
		- Documentation of Authority	X	X		
		- Description of notification procedure	X	X		
	264.52(e)	- Emergency equipment list				

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Documentation of equipment location	X	X		
		- Physical description of equipment	X	X		
		- Statement of equipment capabilities	X	X		
	264.52(f)	- Evacuation Plan				
		- Criteria for implementation	X	X		
		- Description of signal(s) to implement	X	X		
		- Description of primary and alternate routes	X	X		
	264.53	- Contingency Plan Copy Location				
		- Description of location of facility's copy of plan	X	X		
		- Number of duplicate copies distributed and their location	X	X		
	264.54	- Contingency Plan Amendment				
		- Identification of person responsible and authorized to change/amend plan	X	X		
		- Description of procedure to change/amend facility copy of plan	X	X		
		- Description of procedure to insure update of all copies of plan	X	X		
	264.56	- Detailed Emergency Procedures				

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Procedure for facility personnel notification	X	X		
		- Procedure for state/local agency notification	X	X		
		- Procedure for identification of character, source, amount, and areal extent of released materials	X	X		
		- Procedure for assessment of environment/human health hazards	X	X		
		- Identification of On-Scene Coordinator for geographic area	X	X		
		- Description of specific responses and control procedures for				
		- Fire	X	X		
		- Explosion	X	X		
		- Spill	X	X		
		- Description of process shutdown and monitoring procedures	X	X		
		- Description of cleanup procedures and associated material treating, storing, disposal procedures	X	X		
		- Description of emergency equipment cleaning and refitting procedures	X	X		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Description of procedures to insure incompatible waste segregation during cleanup	X	X		
[Note:	There are no §270 requirements which parallel Part 264, Subpart E. However, the applicant should be familiar with the following sections of the regulations since the requirements in them will be enforceable under any permit received. Part 264, Subpart E, §264.70 through §264.77 Part 270.30, Subpart C The applicant should be prepared to respond to inquiries by the permit application reviewers regarding these requirements.]					
270.14(b)(8)		- Preventive Procedures, Structures, and Equipment Documentation, including description of equipment/procedures to				
		- Prevent hazards during unloading operations	X	X		
		- Prevent water supply contamination	X	X		
		- Mitigate equipment failure and power outages	X	X		
		- Prevent undue personnel exposure to wastes	X	X		
270.14(b)(9)	264.17	- Prevention of Accidental Ignition or Reaction Documentation				
		- Description of separation and protection of ignitable, reactive, incompatible wastes	X	X		
		- Description of ignitable, reactive, incompatible wastes handling procedures	X	X		
		- Description of number, location, and type of warning/prohibition signs	X	X		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Documentation that procedures are adequate to prevent accidental ignitions or reactions	X	X		
270.14(b)(9) and 270.20(g) and 270.20(g)	264.17(b)	- Specific Ignitable/Reactive Waste Requirements for Land Treatment Facilities if I/R wastes treated.				
	264.281	- Documentation that application to soil renders waste nonreactive/nonignitable and prevents reactions, or	X	X		
		- Procedures for protecting wastes	O	O		
	264.282	- Procedures which insure that incompatible wastes are not applied to same treatment zone	X	X		
270.14(b)(10)		- Traffic Documentation, identification of:				
		- Waste movement routes	X	X		
		- Number of movements by type vehicle	X	X		
		- Quantity of waste moved per movement per vehicle	X	X		
		- Traffic control signals and personnel	X	X		
		- Route surface composition and load bearing capacity	X	X		
270.14(b)(11)		- Facility Location Documentation				
270.14(b)(11)(i) and (ii)		- Political jurisdiction identified (new facilities only)		X		
		- Comparison to Appendix VI of Part 264	X	X		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Demonstration that faults with displacement in Holocene time are more than 3,000 feet from facility (western states)	X	X		
	264.18(a)	- If Holocene-time faults are within 3,000 feet, demonstration that no faults pass within 200 feet of unit sites (western states)	X	X		
270.14(b)(11), (iii) through (v)	264.18(b)	- Documentation of facility location relative to 100-year flood plain level or wave action flooding	X	X		
		- If unit in flood plain, documentation that facility can withstand the 100-year flood without washout by:	X	X		
		- Analysis of hydrodynamic/hydrostatic forces resulting at site from 100-year flood, and	X	X		
		- Presentation of operating units and flood protection devices design and how they will prevent washout, or	X	X		
		- Plan for removal of waste before washout including,	0	0		
		- Timing of removal relative to flood levels	0	0		
		- Estimated time to remove all waste	0	0		
		- Location to which waste will be moved and proof of compliance with Parts 270 and 264 through 267 of this Chapter	0	0		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Detailed description of personnel, equipment, and procedures for waste removal sufficient to insure availability in time for use	0	0		
		- Analysis of potential for discharge during waste movement	0	0		
		- A plan documenting how and on what time schedule the facility will comply with §264.18(b) if not in compliance (existing facilities only)	X			
270.14(b)(12)	264.16	- Personnel Training Program Documentation				
		- Outline of introductory and continuing personnel training programs	X	X		
		- Identification and qualifications of program instructor	X	X		
		- Brief description of how training program meets actual job tasks	X	X		
		- Description of procedures to insure all appropriate personnel receive appropriate training and receive annual training review	X	X		
		- Description of records to be kept, their location, and procedures to insure they are retained for proper length of time	X	X		
270.14(b)(13)	264.112	- Closure Plan Documentation				
		- Description of partial and final closure procedures	X	X		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Description of maximum unclosed portion during facility life	X	X		
		- Estimate of maximum waste inventory in storage/treatment during facility life	X	X		
	264.114	- Equipment decontamination procedure	X	X		
		- Estimated year of closure	X	X		
	254.113	- Description of closure schedule including	X	X		
		- Total time to close	X	X		
270.14(b)(13)	254.113	- Trackable intervening closure activities	X	X		
		- Location(s) and number of copies of closure plan	X	X		
		- Identification of person responsible for storage and updating of facility copy of closure plan	X	X		
		- Procedure for updating all other copies of closure plan	X	X		
270.14(b)(13) and 270.20(f)	264.112	- Specific Closure Plan Requirements for Land Treatment Facilities				
	264.280(a)	- Procedures to maximize degradation of waste in treatment zone	X	X		
		- Procedures to minimize waste run-off	X	X		
		- Run-off system maintenance procedures	X	X		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Wind dispersal control procedures	X	X		
		- Procedures for compliance with food-chain crop growth	0	0		
		- Procedures for unsaturated zone monitoring	X	X		
		- Description of vegetative cover	X	X		
		- Procedures for establishing vegetative cover	X	X		
270.14(b)(13) and 270.20(f)	264.118 and 264.280(c)	- Specific Post-Closure Plan Requirements for Land Treatment Facilities	X	X		
		- Procedures to enhance degradation of wastes in treatment zone	X	X		
		- Procedure for maintaining vegetative cover	X	X		
		- Procedure for maintaining run-on controls	X	X		
		- Procedure for maintaining run-off controls	X	X		
		- Procedures for wind dispersal control	X	X		
		- Procedures to insure compliance with food-chain crop prohibitions	0	0		
		- Procedures for unsaturated zone monitoring	X	X		
270.14(b)(14)	264.120	- Documentation of Notice on Deed (existing facilities only)	X			
		- Statement that land used to manage wastes	X			

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Statement of restricted use per §284.117(c)	X			
270.14(b)(15)	264.142	- Closure Cost Estimate	X	X		
	264.143 and 264.146	- Documentation of a financial assurance mechanism for closure that is one of the following:	X	X		
	264.151(a)	- Closure trust fund	0	0		
	264.151(b)	- Surety bond guaranteeing payment	0	0		
	264.151(c)	- Surety bond guaranteeing performance	0	0		
	264.151(d)	- Closure letter of credit	0	0		
	264.151(e)	- Closure insurance	0	0		
	264.15(f) and (h)	- Financial test and corporate guarantee	0	0		
		- Multiple financial mechanism for one facility	0	0		
		- Single financial mechanism for multiple facilities	0	0		
270.14(b)(16)	264.144	- Post-Closure Cost Estimate	X	X		
	264.145 and 264.146	- Documentation of a financial assurance mechanism for post-closure that is one of the following:	X	X		
	264.151(a)	- Closure trust fund	0	0		
	264.151(b)	- Surety bond guaranteeing payment	0	0		
	264.151(c)	- Surety bond guaranteeing performance	0	0		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments[1]
	264.151(d)	- Post-closure letter of credit	0	0		
	264.151(e)	- Post-closure insurance	0	0		
	264.151(f) and (h)	- Financial test and corporate guarantee	0	0		
		- Multiple financial mechanism for one facility	0	0		
		- Single financial mechanism for multiple facilities	0	0		
270.14(b)(17)	264.147	- Documentation of Insurance	X	X		
		- Request for variance from insurance	0	0		
	264.151(i) and (j)	- Insurance for sudden/accidental occurrences	X	X		
		- Insurance for nonsudden/accidental occurrences	X	X		
	264.151(g)	- Financial test for liability coverage	0	0		
270.14(b)(18)	264.149	- Documentation of a State Required Financial[1] Mechanism for Closure, Post-Closure, or Liability including	0	0		
		- EPA I.D. number	0	0		
		- Facility name	0	0		
		- Facility address	0	0		
		- Amounts of liability coverage or funds assured	0	0		
	264.150	- Documentation of State Assumed Responsibility[1] for Closure Post-Closure or Liability including	0	0		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Letter from State describing State's responsibilities	0	0		
		- Facility EPA I.D. number	0	0		
		- Facility name	0	0		
		- Facility address	0	0		
		- Amounts of liability coverage or funds assured	0	0		
270.14(b)(19)		- Topographic map showing a distance of 1,000 feet around facility at a scale of not more than 1 inch equals 200 feet that clearly shows	X	X		
		- Contours	X	X		
		- Proper contour intervals	X	X		
		- Map scale and date	X	X		
		- 100-year flood plain area	X	X		
		- Surface waters and intermittent streams	X	X		
		- Surrounding land uses	X	X		
270.14(b)(19)		- Wind rose	X	X		
		- North orientation	X	X		
		- Legal boundaries of facility site	X	X		
		- Access control	X	X		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Injection and withdrawal wells onsite and offsite	X	X		
		- Buildings and recreation areas	X	X		
		- Run-off control systems	X	X		
		- Access and internal roads	X	X		
		- Storm, sanitary, and process sewerage systems	X	X		
		- Loading and unloading areas	X	X		
		- Fire control facilities	X	X		
		- Barriers for drainage or flood control	X	X		
		- Location of past or present operational units and equipment cleanup areas	X	X		
270.17, 270.18, 270.20 and 270.21		Part B Specific Information Requirements				
270.20		- Specific Requirements for Land Treatment Facilities				
270.20(a)		- Description of treatment demonstration plans by	X	X		
	264.272(b)	- Field test	X	X		
270.20(a)		- Laboratory analysis	X	X		
		- Available data	X	X		
		- Operating data (existing units only)	X	X		

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LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Submittal for laboratory analyses or field test demonstration permit including				
	264.272(c)	- Documentation of accurate simulation	X	X		
		- Wastes and hazardous constituents descriptions (Part 261, Appendix VIII)	X	X		
		- Climatologic information	X	X		
		- Topographical data	X	X		
		- Operating practices	X	X		
		- Type of test to be conducted	X	X		
		- Test materials and methods	X	X		
		- Expected completion time	X	X		
		- Statement on appropriateness of demonstration	X	X		
		- Statement on human health and environment protection considering				
		- Characteristics of wastes to be tested	X	X		
		- Operating and monitoring during tests	X	X		
		- Duration of tests	X	X		
		- Volume of waste used in test	X	X		
		- Potential for hazardous waste migration to ground/surface waters (field tests only)	X	X		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
270.20(b)	264.271(a)	- Description of land treatment program				
		- Wastes to be land treated	X	X		
		- Design measures to maximize treatment including	X	X		
270.20(b)(2)(i) through (iv)	264.273(a)	- Rate and method of waste application	X	X		
		- Soil pH control measures	X	X		
		- Microbial/chemical reaction enhancements	X	X		
		- Treatment zone moisture control measures	X	X		
270.20(b)(3)(i) through (vii)	264.278(a) through (f)	- Unsaturated zone monitoring procedures including				
		- List of and rationale for selecting compounds to be monitored	X	X		
		- Monitoring equipment, procedures, frequency	X	X		
		- Procedures for selecting sampling locations	X	X		
		- Sample collection procedures	X	X		
		- Sample preservation/shipment procedures	X	X		
		- Sample chain of custody control	X	X		
		- Sample analysis procedures	X	X		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Background value determination procedures	X	X		
		- Statistical methods description	X	X		
270.20(b)(4)		- List of hazardous constituents expected to be in, or derived from, wastes to be land treated	X	X		
270.20(b)(5)	264.271(c)	- The proposed vertical and horizontal dimensions of the treatment zone with maximum depth of				
		- No more than 5 feet from the initial soil surface	X	X		
		- More than 3 feet above the seasonal high water table	X	X		
270.20(c)(1) through (6)	264.273(b) through (f)	- Description of land treatment unit design				
		- Procedures/equipment to prevent run-on from peak discharge of 25-year storm	X	X		
		- Procedures/equipment to collect and control the run-off water volume from a 24-hour, 25-year storm	X	X		
		- Procedures/equipment to minimize run-off from treatment zone during active life	X	X		
		- Run-on and run-off collection and control system management plan	X	X		
		- Procedures/equipment for wind dispersal control	X	X		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
270.20(d)(1) through (4)	264.276(a)	- Documentation of request for growth of food-chain crops on treatment zone not receiving cadmium in wastes	○	○		
270.20(d)(1) through (4)	264.276(a)	- Statement that demonstration of no risk to human health will be conducted by	○	○		
		- Field tests	○	○		
		- Greenhouse studies	○	○		
		- Available data	○	○		
		- Operating data (existing only)	○	○		
		- Demonstration program description, including	○	○		
		- Soil pH	○	○		
		- Cation exchange capacity of soil	○	○		
		- Specific wastes to be applied	○	○		
		- Waste application rates	○	○		
		- Waste application methods	○	○		
		- Identification of demonstration crops	○	○		
		- Planting and growth procedures	○	○		
		- Characteristics of crop	○	○		
		- Sample selection criteria	○	○		
		- Sample collection procedure	○	○		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
270.20(d)(1) through (4)	264.276(a)	- Sample size	0	0		
		- Analyses methods	0	0		
		- Statistical data evaluation procedures	0	0		
		- Identification of comparison crops	0	0		
		- Characteristics of crop	0	0		
		- Planting and growth procedures	0	0		
		- Conditions of growth	0	0		
		- Sample selection criteria	0	0		
		- Sample collection procedures	0	0		
		- Sample size	0	0		
		- Analyses methods	0	0		
		- Statistical data evaluation procedures	0	0		
		- Request for a permit to conduct demonstration program	0	0		
270.20(e)	264.276(b)	- Documentation of request for growth of food-chain crops on treatment zone if wastes contain cadmium	0	0		
		- Cadmium concentration in waste	0	0		
		- Soil pH	0	0		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Annual application of cadmium in kilograms per hectane	0	0		
		- Soil cation exchange capacity	0	0		
		- Identification of animal feeds to be grown	0	0		
		- Plan to prevent animal feed ingestion by humans	0	0		
		- Documentation of notice on deed	0	0		
		- Internal and external pressure gradients	0	0		
270.14(c)	Part 264 Subpart F	Part B Protection of Ground-Water Information Requirements for Surface Impoundments, Waste Piles, Land Treatment Units, and Landfills				
270.14(c)(1)		- Interim status period ground-water monitoring data summary	X			
270.14(c)(2)		- Identification of uppermost and hydraulically interconnected aquifers under facility including	X	X		
		- Water flow rate and direction	X	X		
		- Bases for identification	X	X		
270.14(c)(3) and 270.14(b)(19)		- Topographic map	X	X		
		- Delineation of property boundary	X	X		
	264.95(b)	- Delineation of waste management area	X	X		
	264.95(a)	- Delineation of proposed point of compliance	X	X		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Ground-water monitoring well locations	X	X		
		- Location of aquifers	X	X		
270.14(c)(4)(i) through (ii)		- Descriptions of existing contamination	X			
		- Delineation of plume extent	X			
		- Appendix VIII constituents concentrations	X			
		- Concentrations throughout plume	X			
		- Maximum concentration in plume	X			
270.14(c)(5)	264.97	- Detailed plans and an engineering report of Ground-Water Monitoring Program	X	X		
	264.97(a)	- Description of wells	X	X		
		- Number of wells	X	X		
		- Locations	X	X		
		- Depths	X	X		
		- Assurance of unaffected background water measurement	X	X		
		- Assurance of compliance point ground-water measurement	X	X		
	264.97(c)	- Casing description	X	X		
	264.97(d)	- Description of sampling/analysis procedures	X	X		
		- Sample collection methods	X	X		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Sample preservation/shipment	X	X		
		- Analytical procedures	X	X		
		- Chain of custody control	X	X		
	264.97(e)	- Documentation of proper/adequate analytical procedures	X	X		
	264.97(f)	- Procedure for determination of ground-water elevation with each sample	X	X		
270.14(c)(6)	264.91(a)(4) and 264.98	- Description of Detection Monitoring Program[2] including				
270.14(c)(6)(i)	264.93 and 264.98(a)	- List of indicator parameters, waste constituents, reaction products to be monitored for, including	X	X		
		- Type, quantities, concentrations expected in wastes	X	X		
		- Mobility, stability, persistence in unsaturated zone	X	X		
		- Detectability in ground-water	X	X		
270.14(c)(6)(ii) and (iii)	264.98(a)(4) and 26498(c)(1)	- Background ground-water concentration values and coefficients of variation established by one of the following[3]:	X	X		
	264.98(c)(3)	- Use of an appropriate ground-water monitoring system, and	O	O		
	264.97(g)(1)	- Quarterly sampling of upgradient wells for one year, or	O	O		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
	264.97(g)(3)	- Quarterly sampling of other wells for one year, and	0	0		
	264.97(g)(4)	- Data from a minimum of one sample/well and minimum of four samples per quarter, or	0	0		
		- Presentation of procedures to calculate such values	0	0		
270.14(c)(6)(ii)	264.98(b)	- Description of an appropriate ground-water monitoring system to be installed at the compliance point	X	X		
270.14(c)(6)(iv)	264.98(d)	- Procedures for collecting semi-annual ground-water samples at the compliance point during	X	X		
		- Active life	X	X		
		- Closure period	X	X		
		- Post-closure period	X	X		
	264.98(e)	- Procedure for annual determination of uppermost aquifer flow rate and direction	X	X		
	264.98(f) and 264.97(d) and (e)	- Documentation of sample collection and analysis procedures	X	X		
	264.98(g)	- Procedure for determining a statistically significant increase for any monitored parameter or constituent by	X	X		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Comparing compliance point data to background value data using the procedures in §264.97(h)(1) or (2), and	X	X		
		- Providing an estimate of the time period after sampling completion necessary to obtain results	X	X		
	264.98(h)	- Procedure to be implemented if a statistically significant increase in any constituent or parameter is identified at any compliance point monitoring well, including	X	X		
	264.98(h)(1)	- Written notification to Regional Administrator	X	X		
	264.98(h)(2)	- Sample collection and analysis methods for all Appendix VIII constituents at all monitoring wells	X	X		
	264.98(h)(3)	- Method for establishing Appendix VIII constituent background values	X	X		
	264.98(h)(4)	- Preparation of an application for permit modification to establish compliance monitoring	X	X		
270.14(c)(7)	264.91(a)(1) and 264.99	- Description of Compliance Monitoring Program[4], including	0	0		
		- List of wastes previously handled at facility	0			
		- Characterization of contaminated ground-water[5]	0			
		- Hazardous constituents identified	0			

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- Hazardous constituents concentrations	0			
	264.99(b)	- Description of compliance monitoring system at the compliance point	0	0		
		- List of hazardous constituents to be compliance monitored	0	0		
	264.96	- Proposed compliance period	0			
	264.99(d)	- Procedure for collecting quarterly samples at compliance point during compliance period	0	0		
	264.99(c)(3)	- Procedures for establishing background concentration values for constituents that are based on one of the following:	0	0		
		- Use of an appropriate ground-water monitoring system, and	0	0		
	264.97(g)	- Data that is available prior to permit issuance	0	(		
		- Data that accounts for measurement errors in sampling and analysis	0	0		
		- Data that accounts for seasonal ground-water quality fluctuations	0	0		
		- Data from a minimum of one sample per well and a minimum of four samples from monitoring system, each time system is sampled	0	0		
270.14(c)(7)(iv)	264.92 and 264.99(c)(1), (2)	- Proposed concentration limits for constituents with justification based on	0	0		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
		- §264.94(a)(1) and §264.97(g)	0	0		
		- §264.94(a)(2)	0	0		
		- §264.94(b) and §264.99(c)(1)	0	0		
	264.99(e)	- Procedure for annual determination of uppermost aquifer flow rate and direction	0	0		
	264.99(f)	- Procedures for annual testing of all compliance point wells for Appendix VIII constituents	0	0		
	264.99(g)	- Documentation of all sampling and analysis procedures	0	0		
	264.99(h)	- Procedures for determining a statistically significant increase for any monitored constituent by	0	0		
		- Comparing compliance point data to the concentration limit using the procedure in §264.97(h)(2)	0	0		
		- Providing an estimate of the time period after sampling completion necessary to obtain results	0	0		
	264.99(i)	- Procedures to be implemented if the ground-water protection standard is exceeded at any compliance point monitoring well, including	0	0		
	264.99(i)(1)	- Written notification to Regional Administrator	0	0		

LAND TREATMENT (Continued)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
	264.99(i)(2)	- Preparation of an application for permit modification to establish a corrective action program, including	0	0		
		- Details of program to comply with ground-water protection standard	0	0		
270.14(c)(7)(v)	264.99(i)(2)(ii)	- Details of ground-water monitoring to demonstrate effectiveness of program	0	0		
270.14(c)(8)	264.91(a)(2) and 264.100	- Description of Corrective Action Program[6], including	0	0		
270.14(c)(8)(i)		- Characterization of contaminated ground-water	0			
	264.100(a)(1)	- Identified hazardous constituents	0			
		- Concentrations of hazardous constituents	0			
270.14(c)(8)(ii)	264.100(a)(2)	- Concentration limit for each hazardous constituent	0	0		
270.14(c)(8)(iii)	264.100(b)	- Detailed plan and an engineering report describing the corrective actions to be taken at the compliance point	0	0		
	264.100(c)	- Time period necessary to implement corrective action program	0	0		
270.14(c)(8)(iv)	264.100(d)	- Description of ground-water monitoring program that will be sufficient to assess the adequacy of corrective action	0	0		

LAND TREATMENT (Concluded)

Part 270	Part 264	Subject Requirement	Existing Units	New Units	Location in Application	Comments
	264.91(a)(3) and 264.100(e)	- Description of the corrective action to be taken for constituents in ground-water between compliance point and downgradient facility boundary	0	0		
	264.100(g)	- Procedure and content for semi-annually submitting written reports to the Regional Administrator on program effectiveness	0	0		
		Part B Certification and Signatories				
270.11(d)		- Certification paragraph	X	X		
270.11(a)		- Appropriate signatory	X	X		

FOOTNOTES FOR LAND TREATMENT UNITS

[1] State-specific. Contact State or Regional EPA representatives to discuss requirements.

[2] Applies to new facilities and existing facilities at which contamination has not been detected.

[3] Existing facilities must submit interim status ground-water monitoring data, including background data for certain parameters. If no data are available, contact appropriate State or Regional EPA personnel.

[4] Required of existing facilities where ground-water monitoring data indicate the presence of hazardous constituents. New or existing units without contamination may have a Compliance Monitoring Program included in the permit on "stand-by" under some circumstances.

[5] Applicable to existing facilities with indications of hazardous constituents in the ground water.

[6] Applicability to existing facilities will be case-by-case, based on monitoring data that indicate ground-water contamination. Under some circumstances, new or existing units without contamination may have Corrective Action Plans included in a permit on "standby."

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SECTION 8.0

LANDFILL PERMIT APPLICATION GUIDANCE

The regulations promulgated in Part 264 apply to both new and existing landfill waste management units and distinguish between these units in appropriate circumstances. Part 264, Subpart N contains the design and operating standards. This section of the manual is divided into eleven subsections:

8.1 Waste Description
8.2 Design and Operating Requirements
8.3 Closure
8.4 Post-Closure
8.5 Special Requirements for Ignitable or Reactive Wastes
8.6 Special Requirements for Incompatible Wastes
8.7 Special Requirements for Liquid Wastes
8.8 Special Requirements for Containers
8.9 Disposal of Small Containers in Overpacked Drums (Lab Packs)
8.10 References
8.11 Checklist

The regulatory goal adopted in the design and operating standards is to minimize the formation and migration of leachate to the adjacent subsurface soil or ground water or surface water. To this end, unless exempted, units must have liners to prevent migration of wastes to the subsurface soil or to ground water and surface waters during the active life of the unit. Landfills are also required to have leachate collection and removal systems. A available to units if applicants demonstrate that wastes will never variance from the liner and leachate collection requirements is migrate to ground water or surface water. In addition, existing portions of units are exempt from these requirements.

8.1 WASTE DESCRIPTION

8.1.1 The Federal Requirement

Section 270.21(a) requires that the Part B application include:

> A list of the hazardous wastes placed or to be placed in each landfill or landfill cell;

The above Part 270 requirement does not apply to any one specific Part 264 standard in the Subpart N landfill requirements. Rather, the required information is necessary to comply with all the landfill requirements.

8.1.2 Guidance to Achieve the Part 264 Standard

The general facility standards [specifically Section 264.13(a)] require the applicant to complete waste analyses as necessary to treat, store, or dispose of wastes in accordance with all of the Part 264 standards. The Permit Applicants' Guidance Manual for General Facility Standards (Reference 1), provide guidance on waste analyses and waste analyses plans.

8.1.3 Guidance to Address the Application Information Requirement

Section 270.21 requires the applicant to submit a list of all hazardous wastes that will be disposed of in the landfill. A suggested attachment to the permit application is List of Hazardous Wastes. The following information on each waste should be reported:

- Common name of the waste.
- EPA hazardous waste ID number.
- Location(s) within landfill where waste is or will be disposed of (e.g., cell number).
- Volume of waste received per month including actual or estimated averages, maximums and minimums.
- Form of the waste when disposed (e.g., containerized, sludge, bulk solid).
- Approximate moisture content, texture, and other significant features of the waste.
- Special handling requirements.

The sampling and analytical methods applicable to identifying the characteristics of hazardous waste placed in landfills are described in Part 261 of the regulations and in EPA Publication Number SW-846, "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Properties" (2).

The applicant is advised that additional waste analysis information must be included in Part A of the application (see §270.13) and in the general facility description (see §270.14). The Part A must include a specification of the hazardous wastes to be disposed of at the facility, an estimate of the quantity of such wastes to be disposed annually, and a general description of the processes to be used for such wastes. The Permit Applicants' Guidance Manual for General Standards (1) includes guidance on the general information requirements (i.e., §270.14) on waste analysis. The information reported for the landfill will be a subset of the information reported for the entire facility when the facility consists of other waste management units(e.g., surface impoundments).

8.2 DESIGN AND OPERATING REQUIREMENTS

This section provides guidance on the permit application information requirements related to the design and operating requirements contained in §264.301. This section addresses the Part 270 and Part 264 standards in the order in which they appear. Topics discussed include the following:

- 8.2.1 Liner Performance Standards
- 8.2.2 Leachate Collection and Removal System
- 8.2.3 Liner and Leachate Collection and Removal System Exemption Variance
- 8.2.4 Control of Run-On
- 8.2.5 Control of Run-Off
- 8.2.6 Management of Units Associated with Run-On and Run-Off Control Systems
- 8.2.7 Management of Wind Dispersal
- 8.2.8 Ground-water Protection Subpart F Exemption
- 8.2.9 Inspections

8.2.1 Liner Performance Standards

8.2.1.1 The Federal Requirements --

Section 270.21(b)(1) requires that the Part B application include:

> (ii) Detailed plans and an engineering report describing how the landfill is or will be designed, constructed, operated, and maintained to comply with the requirements of §264.301. This submission must address the following items as specified in §264.301...
>
> (1) The liner system and leachate collection and removal system (except for an existing portion of a landfill)....

Section 264.301(a)(1) states:

(A) A landfill (except for an existing portion of a landfill) must have:

(1) A liner that is designed, constructed, and installed to prevent any migration of wastes out of the landfill to the adjacent subsurface soil or ground water or surface water at any time during the active life (including the closure period) of the landfill. The liner must be constructed of materials that prevent wastes from passing into the liner during the active life of the facility. The liner must be:

(i) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;

(ii) Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift.

(iii) Installed to cover all surrounding earth likely to be in contact with the waste or leachate.

8.2.1.2 Guidance to Achieve the 264 Standard --

Section 264.301(a) contains two key elements:

- It exempts "existing portions" from the requirement to install a liner and a leachate collection and removal system; and
- It establishes a general performance standard for liners (i.e., the liner must be constructed of materials that prevent wastes from passing into the liner during the active life of the facility).

An "existing portion" means that land surface area of an existing waste management unit (included in the original Part A permit application) on which wastes have been placed prior to the issuance of a Part B permit. Existing portions are exempt from the requirement to install a liner and a leachate collection and removal system. However, they remain subject to the remainder of the design and operating requirements, in §264.301, as well as the ground-water protection requirements of Part 264, Subpart F.

EPA interprets the general performance standard to mean that only synthetic liners comply with §264.301(a)(1). Synthetics are essentially 100 percent effective, when installed properly and undamaged, in rejecting leachate reaching the liner surface. The leachate can then be removed by the leachate collection system.

The Agency realizes that very small amounts of liquid may enter the structure of synthetic membranes, causing them to swell, but the amount is negligible. The Agency also believes that clay liners are valuable as backups to synthetic liners and recommends their use as an extra measure of protection in all cases. The use of a clay secondary liner at facilities that will operate longer than 30 years is a specific example of where a clay secondary liner should be used.

There are several different types of synthetic liners; each is compatible with certain types of wastes, but incompatible with other types. No one synthetic liner material can be used with all wastes. The following types of synthetic liners are most commonly used:

- High density polyethylene

- Chlorosulfonated polyethylene
- Polyvinyl chloride
- Chlorinated polyethylene

The applicant should refer to Reference 3 for additional examples of synthetic liner materials. Appendix VIII, of Reference 3, Suggested Standards for Representative Flexible Polymeric Membranes, can be used as a guidance tool for obtaining the minimum values of physical properties of a synthetic liner that are necessary to produce a quality liner material.

In addition to the general liner performance standard, §264.301(a)(1) also includes several subsidiary performance standards intended to assure that each liner will meet the goal of preventing wastes from passing into the liner during the landfill's active life, including the closure period. These subsidiary standards consist of general engineering goals addressing:

- Chemical characteristics of liners
- Liner strength and thickness
- Liner foundations
- Liner extent

Guidance on designs that comply with these standards is provided in Reference 3 and in the RCRA Guidance Document for Landfills (Reference 4).

8.2.1.3 Guidance to Address the Application Information Requirement

Liner selection and design is one of the most difficult prospects of landfill design. The liner serves as a primary barrier to leachate migration. It must be chemically compatible with this leachate, and it must be strong enough to resist tearing during installation and operation. The nature of the liner foundation is an integral part of liner design. To address the application information requirements for liner system design, the applicant is advised to submit information on the following three areas:

- Liner Specifications
- Foundation Analysis
- Liner Integrity Analysis

A suggested attachment to the permit application is Liner System Design. The attachment should contain detailed specifications, raw data, calculations, drawings, assumptions, etc. supporting the proposed design. A discussion of the rationale supporting the overall design should be included in the basis portion of the application. The discussion should present the reasons why and how the design meets the specific requirements. The applicant is responsible for all aspects of the application including material specifications.

8.2.1.3.1 Liner Specifications

The applicant should identify the materials of construction, and specifications of strength, thickness, and chemical properties of the proposed liner. The applicant should also submit design plans that show the method of liner placement in the landfill unit(s); this should demonstrate that the liner will cover all areas of the unit that will be exposed to wastes and leachate.

This normally means that the floor and walls of the cell or trench must be lined. Liner material specifications can be taken from the specifications provided by the manufacturer as long as the applicant proposes these as the minimum acceptable specifications. Liner integrity analysis section describes the nature of engineering reports to justify the selected liner strength, thickness, and chemical compatibility. Appendix VIII of Reference (3) can be used to obtain the minimum values of properties of a synthetic liner that are necessary to specify a quality liner material.

The liner design plans should be in standard construction drawing format. The plans should show the extent of areal coverage for each landfill unit. The plan should also present cross-sectional views. Details of seaming methods, anchoring, and other special features should be provided in the plans and in narrative form. See Appendix D for synthetic liner guide specifications.

8.2.1.3.2 Foundation Analysis

The soils beneath a liner support the liner, waste, and cover. If these soils settle, shear, or uplift, the liner may be damaged. Hydrostatic and gas pressure can also impact on liner performance. The potential for these situations to occur at a given location can be reliably assessed by a qualified registered geotechnical engineer. In many cases, standard engineering practices can be implemented to alleviate a potential for liner deflection.

The foundation analysis should be a report included in the Liner System Design attachment that assesses the potential for liner deflection due to settlement, compression, shear, or uplift of the foundation soils, and due to hydraulic and gas pressures on the liner. The following items should be considered in this report:

- Geologic data. A description should be provided of regional and site geology, including:
  - -- geologic setting
  - -- bedrock types and depths (include boring logs)
  - -- sediment types and characteristics (include boring logs)
  - -- subsidence history
  - -- sinkhole potential

  [Note that much of this information is also recommended in Section 9.0.]

- Geotechnical Data. A description should be provided of the engineering characteristics of the foundation soils. Data on soil index properties, shear strength, hydraulic conductivity, and compressibility should be provided.

- Hydrogeologic Data. A description should be provided of the characteristics of the saturated zone of the site, including its relationship to surface water. Section 9.0 can be used for further guidance on this topic.

- Seismic Setting. A description should be provided on the potential for ground shaking and surface rupture at the side. While the facility may not be in a jurisdiction in which the seismic location standard (§264.18(a)) is applicable, it is adviseable to design a facility to withstand a design earthquake. Many regions of the country that have information on the frequency and magnitude of earthquake activity, and may even have established local standards for the design of structures. Earth structures can generally be easily designed to withstand the vertical and horizontal accelerations experienced during such design earthquakes.

The report should summarize the foundation investigation and analysis. It should include all data collected during the investigation, all calculations performed in the analysis, and a description of the methods used in the investigation and analysis. Total and differential settlements that can occur during the active and closure period of the unit should be estimated, including immediate settlement, primary and secondary consolidation, creep, and liquification. The bearing capacity and stability of the foundation should be evaluated.

The subsurface investigation should thoroughly characterize the in-situ properties of the subsurface materials. The subsurface exploration should consist of test borings and test pits, and may also include geophysical surveys.

Test borings should be performed to adequate depths and at a sufficient number of locations to define the subsurface conditions. The method of drilling should be based on a preliminary subsurface investigation. Test pits should be excavated to identify near-surface conditions. Geophysical surveys may be performed to more accurately identify bedrock depths and fractured zones. Other types of geotechnical tests (i.e., cone penetrometer, vane shear, standard penetration) may be performed as required for the specific conditions at the site. Many standard techniques for geotechnical investigations are available in Sampling of Soil and Rock, American Society For Testing and Materials (ASTM) Special Technical Publication 483, ASTM, June 1970 and Subsurface Exploration and Sampling of Soils for Civil Engineering Purposes, M. Juul Hvorslev, Army Corps of Engineers

Waterways Experiment Station, 1965. The subsurface investigation program can be combined with the investigations undertaken in response to the ground-water monitoring and aquifer identification requirements in Part 264 Subpart F.

Laboratory testing of subsurface materials should be conducted to determine index properties and engineering parameters. Index property testing should include:

- Grain size distribution curves
- Atterberg limits
- Specific gravity
- Moisture content and dry density

Shear strength of soils may be determined using direct shear, triaxial, or unconfined compression testing, as appropriate for the soil condition. The methods for saturated hydraulic conductivity determination described in Reference 4 (Method 9100) should be used; in most cases, hydraulic conductivity (often referred to as permeability) should be determined using field methods, rather than laboratory techniques. The compressibility characteristics should be determined by performing a sufficient number of consolidation tests.

8.2.1.3.3 Liner Integrity Analysis

The integrity of a liner is a function of several factors. Incompatible chemicals can dissolve the liner. Excessive stress during either installation or operation can cause tears or broken seams. Climate can also adversely affect a liner. It is critical that a liner be carefully selected to be compatible with the wastes it must contain. The liner must also have adequate strength to resist tearing during installation. It must be protected from puncturing during operation by a bedding layer. Normally, the leachate collection system can be the protective layer for the top of the liner; a bedding layer beneath the liner is also needed. Seaming techniques are extremely important as well. Finally, the liner should have sufficient strength to resist failure from any anticipated or likely settlement or movement of the foundation.

The applicant should submit a detailed report that demonstrates the integrity of the liner against:

- contact with waste/leachate (i.e., waste-liner compatibility),
- internal and external pressure gradients,
- climatic conditions, and
- daily operational stresses.

Waste-Liner Compatibility

The applicant should submit results of compatibility testing. These results should demonstrate the acceptability of the selected synthetic liner. The following information should be provided on the tests used to make the compatibility demonstrations.

- The name of test method that was used.
- The procedure and details of the test method (e.g., number of test specimens, length of the test, and the nature of leachate used).
- Chemical and physical characteristics of the wastes(s) tested including the EPA hazardous waste number, physical class (e.g., aqueous-inorganic, aqueous-organic; organic; solid, sludge, etc.), waste sources (including description or production and waste treatment processes from which the waste stream is generated.

- The raw tests results, and
- An explanation of how the raw test results were interpreted to lead to the selection of the synthetic liner proposed as the primary liner for the landfill.

An acceptable test method for examining the compatibility of wastes/leachate and synthetic liners is the Immersion Test of Membrane Liner Materials for Compatibility with Wastes, and is found as Method 9090 in Test Methods for Evaluating Solid Waste (Reference 2). An earlier form of this test was published as Appendix A in the July, 1982 draft RCRA Technical Guidance Document entitled Landfill Design: Liner Systems and Final Cover (Reference 4)

Liner manufacturers commonly provide information on the compatibility of their liners with single chemical compounds. This information is generally in the form of qualitative rankings (e.g., resistant, poor), rather than in quantitative form. These types of data may be supportive, but will not be accepted as definitive proof of compatibility. In most actual situations, a liner will be exposed to a combination of waste types, rather than to a single chemical compound. Consequently, the manufacturers' tests do not adequately simulate field exposure conditions. Also, EPA is unaware of the numerical bases used by manufacturers in establishing their qualitative rankings. EPA must examine the raw data from the exposure tests.

Waste compatibility tests should be conducted using representative samples of the wastes and leachates to which the liner is, or will be exposed. Several methods for obtaining samples of hazardous wastes are discussed in Section One of Test Methods for Evaluating Solid Waste (2). Reference 17 also provides information on collecting leachate samples. Selection of a method depends on the ambient physical state of the waste to be sampled (liquid, slurry, solid). If the waste is a liquid or has a free liquid component, this liquid is called the primary leachate and must be included in the sample. If the waste is a solid or slurry that does not have a free liquid component, then the procedures given below for extracting primary and secondary leachates should be employed.

The primary leachate is the liquid that can be extracted from the waste by vacuum filtration at 25° C and 15.3 kg/cm^2 (15 bars) of vacuum. It should be measured as a percentage of the total waste on a wet weight basis. If there is more than one distinct immiscible phase in the primary leachate, collect enough of each phase (approximately 5 liters) to perform the compatibility testing with each phase. The secondary leachate is a fluid extracted by vacuum filtration after mixing the waste thoroughly with just enough water to make a saturated paste (waste barely flows together into a hole in the paste made with a spatula).

The Agency encourages applicants to include the use of liner samples (coupons) in the liner system design. The coupons should be separate pieces of liner material at least one foot square and include one field seam. The coupons are placed in the waste management unit and later retrieved and tested to assess the liner's integrity. Testing of the coupons can forewarn permittees of liner deterioration far enough in advance of failure that remedial action may be taken before failure which could result in catastrophic contamination and immense corrective action costs. The Agency also hopes to obtain data from sites using coupons to further the knowledge of liner integrity. See Section 5.4.7 of Reference 3 for more details on the use of coupons.

As discussed above, the applicant should submit data on the physical classification of the waste with the compatibility description of the physical classes of waste. Aqueous-inorganic (AI) and aqueous-organic (AO) are classes of waste in which water is the solvent (predominant liquid), and the solutes are mostly inorganic and organic, respectively. Organic (O) is the class of waste in which the predominant liquids are organic, and the solutes are mostly other organic chemicals dissolved in the organic solvent. Solids, sludges, and slurries (S) are wastes high in solids such as tailings, settled matter, or filter cakes.

Climatic Conditions

During the liner system design, the applicant should consider the impacts of the local climate on the material(s) selected. Data supporting the liner selection with regard to climate should be submitted in the application including:

- Extremes of air temperatures at the units location
- Depth of soil freezing including local building codes regarding subsurface foundation construction
- Average monthly temperatures and relative humidity readings
- Maximum depth to permafrost (applicable only to sites in Alaska)
- Data regarding the proposed liner's reactions (cracking, loss of strength, etc.) to the above conditions.

The above climatic data should be available from the nearest office of the National Weather Service. These offices are often located at airports. Building codes can be obtained from local county offices issuing building permits.

Liner manufacturers' data concerning the responses of the proposed liner to the local climatic conditions should be included. Quantitative data should be provided where available. These should include the liner's strength, resistance to tearing, puncture, and other failures at the range of conditions likely to be encountered. Cracking tendency is particularly important for liners to be installed in cold climates and those exposed to a seasonal freeze-thaw cycle. Manufacturer's and other data should be submitted indicating the material's resistance to cracking.

Applicants may be able to reduce the negative effects of the local climate through proper design techniques and/or selection of materials. A liner installed entirely below the local freeze line will not be subjected to the freeze-thaw cycle and resulting stresses. Materials for the upper (above freeze line) portion of a liner may be selected of one materi and the lower portion of another. However, caution should be exercised concerning waste-liner compatibility and the ability to join dissimilar materials.

Installation Stresses

Stresses during installation can come from both below and above the liner. The subgrade or bedding material on which the liner is placed can exert pressures if rocks, roots, or similar materials remain near the surface. Placement of the liner itself and seaming techniques can stress the liner. Action of earth moving equipment spreading a bedding layer above the liner and installation of a leachate collection system can also stress or damage a liner. The liner system design should take into account these considerations and include the following information:

- State whether a bedding material will be placed above or below the synthetic liner. The thickness of this bedding layer, the type of material used in the bedding layer and a drawing of the bedding layer in relation to the placement of the synthetic layer should be provided. Methods to be used to prepare the bedding material surface (discing, compaction, rolling, etc.) should be described. An explanation of how the synthetic liner will be protected from punctures or tears during installation and operation should be provided if a protective bedding layer is not proposed in the design.
- Treatment of bedding material to prevent plant growth should be described.
- Slope at the sides of the unit and the ability of the sides to resist creep or slumping during installation
- Methods to be used during liner installation to minimize stress and change including detailed techniques for field seaming
- Methods to be used to place bedding material over liner and specifications for the bedding material

The liner system design should thoroughly address the above items. This should include engineering drawings, detailed construction specifications, and technical reports as necessary. More details are available in Chapter 5 of Reference 3.

Operational Stresses

Daily operation of the landfill will apply stresses to the liner(s). The Liner System Design should account for these stresses and minimize them. Information to be included in the application should include the following:

- Overall layout and filling sequence of the unit(s)
- Traffic patterns at the site, particularly near the edges of the liner(s) and in the portions of the landfill closest to the liner
- Soils data indicating that adequate protection will be provided to minimize operational stresses
- Design considerations that will minimize liner stress
- Operational techniques to reduce liner stress.

Specific, technical soils data can be taken from the foundation analysis portion of the Liner System Design. Design and operational factors should minimize stress. The landfill could be designed for sequential filling with one area completely filled and closed before starting another area. The second area may have a different entrance and exit, thus reducing traffic stress at the original entrance and exit.

Depending on the soils, climate, and operations, the bedding layer and/or surface roadways, etc. may have to be periodically thickened, recompacted, graded, and otherwide maintained to reduce liner stress. Applicants should consider these possibilities and include them as appropriate.

Pressure Gradients

Sources of liner stress other than the above may also be present. These include pressure gradients caused by soil movement, water above or below the liner(s) and gases either above or below the liner(s). These situations should be considered and a liner with adequate strength and thickness selected. Information to be included in the application includes:

- Potential for the foundation to be partially lost or to deform due to piping, sinkholes, decomposition of organic matter, slumping, etc. and the ability of the liner to withstand resulting stresses
- Impact of unexpected changes in water levels above or below the liner(s) such as leachate temporarily deeper than one foot due to heavy storms
- Potential for generation of gas within the waste contained or present outside the liner.

In addressing information regarding internal and external pressure gradients, the applicant should submit detailed engineering reports demonstrating that the liner system will withstand the various physical stresses throughout the active life of the landfill. Soils-related information may be obtained from the foundation analysis. The soils factors listed above should be considered during site selection and design and applied to liner selection. The impact of unusual water conditions should be analyzed. Often soil-related problems are caused by unusual water situations. It may be wise to assess both together in a near worst-case scenario in the development of the Liner System Designs.

The applicant should consider potential gas pressures when designing the liner(s). Gas pressure could develop above, below, and possibly between liners (in a double-lined landfill). Gases may be generated in the wastes via anaerobic decomposition of organic matter yielding methane and carbon dioxide (landfill gas) or via other mechanisms. These gases normally migrate to the surface and vent to the atmosphere. However, gas can migrate laterally and/or accumulate in localized areas resulting in pressure on the liner(s). These conditions may become more pronounced after closure when the cover is in place, and are waste-specific. Gases within the waste may transport hazardous constituents. If vented to the atmosphere, these gases may require treatment prior to release.

External gas pressure should also be considered. Gas may be present or be generated beneath a landfill's liner(s). Sites located in soils containing significant amounts of organic matter have potential gas problems. Existing units may be releasing gas to the subsurface. New units built near existing units might be affected by this gas. This is especially true of new hazardous waste landfills adjacent to sanitary landfills, either active or closed.

8.2.2 Leachate Collection and Removal System

8.2.2.1 The Federal Requirements --

Section 270.21(b) requires the applicant to submit information in the Part B permit application addressing:

> (1) The liner system and leachate collection and removal system (except for an existing portion of a landfill)...

Section 264.301(a)(2) states that a landfill (except for an existing portion of a landfill) must have:

> (2) A leachate collection and removal system immediately above the liner that is designed, constructed, maintained, and operated to collect and remove leachate from the landfill. The Regional Administrator will specify design and operating conditions in the permit to ensure that the leachate depth over the liner does not exceed 30 cm (one foot).
>
> The leachate collection and removal system must be:
>
> (i) Constructed of material that are:
>
> (A) Chemically resistant to the waste managed in the landfill and the leachate expected to be generated;
>
> (B) Of sufficient strength and thickness to prevent collapse under the pressures exerted by underlying wastes, waste cover materials, and by any equipment used at the landfill;
>
> (ii) Designed and operated to function without clogging through the scheduled closure of the landfill.

8.2.2.2 Guidance to Achieve the Part 264 Standard --

8.2.2.2.1 Maximum Head of Leachate -- To minimize the potential for release of hazardous constituents during the regulated unit's active life, landfills (except for existing portions) must have a liner and leachate collection and removal system. To reduce pressure head on the liner, the leachate collection and removal system must be designed and operated to assure that leachate depth over the liner does not exceed 30 cm (1 ft.). The Agency believes that it is practical to design a leachate collection and removal system to maintain leachate depth at the above depth or less, except perhaps temporarily during severe storms.

The Agency recommends that leachate collection and removal systems should be constructed of a sand or gravel that is have at least a 30 centimeter (12 inch) thick layer with a hydraulic conductivity not less than 1 x 10^{-3} cm/sec and a minimum slope of 2 percent. For additional guidance and rationale for the design of the leachate collection and removal system the applicant should refer to Reference 4. See Figure 8-1 for a generalized diagram of a liner and leachate collection system.

8.2.2.2.2 Chemical Resistance -- All leachate collection and removal systems must be designed so that they will continue to function. They must be capable of withstanding the chemical attack that can result from contact with leachate. The leachate from landfills is likely to be chemically corrosive to many materials. Construction materials, especially for the perforated collection pipes, must resist deterioration for the required operational lifetime. This means that the applicant must have knowledge not only of the materials included in the landfill, but of the possible interactions that can occur with the mixing of heterogeneous materials. It is also important to take into consideration the chemical effect of the leachate on the pumps to be used for leachate removal and materials used to construct the risers or manholes accessing the sumps from which the leachate is withdrawn.

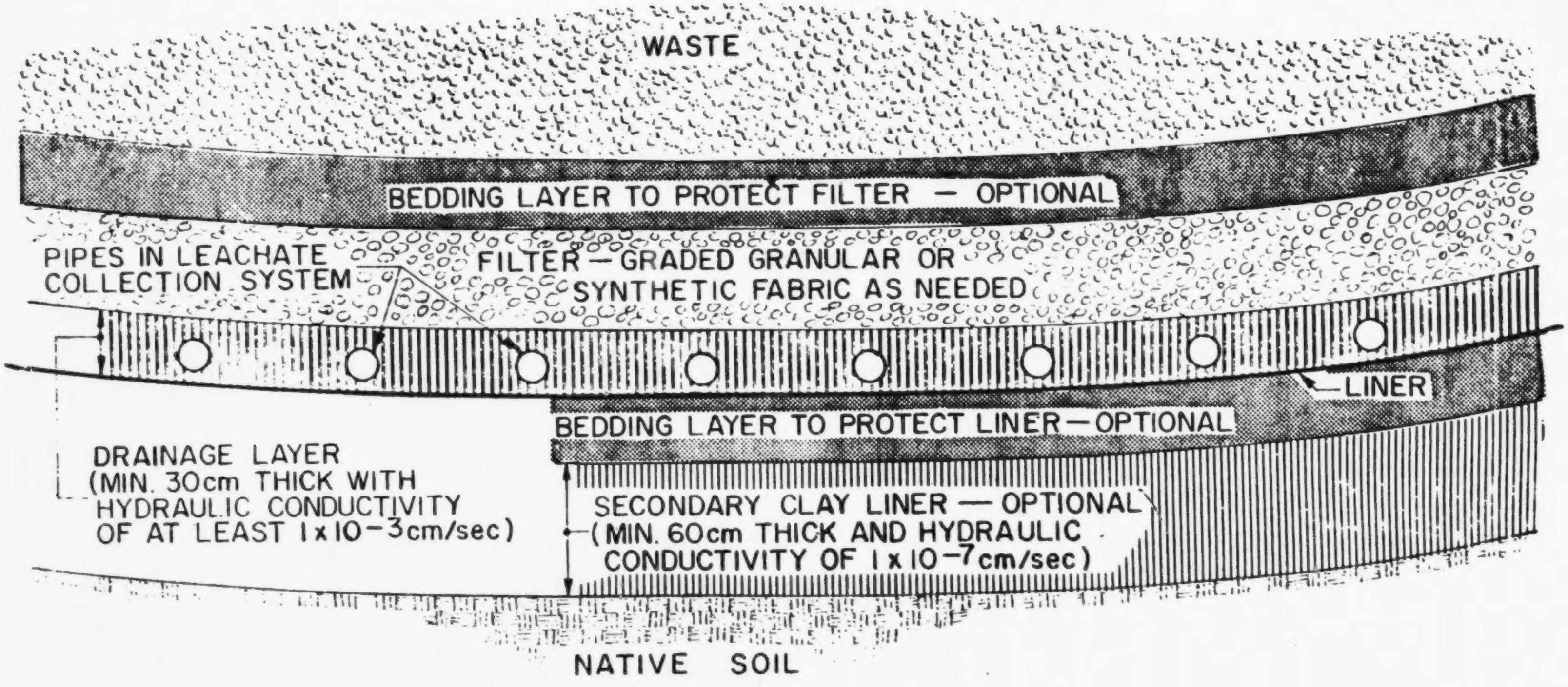
WASTE
BEDDING LAYER TO PROTECT FILTER — OPTIONAL
PIPES IN LEACHATE COLLECTION SYSTEM
FILTER — GRADED GRANULAR OR SYNTHETIC FABRIC AS NEEDED
LINER
BEDDING LAYER TO PROTECT LINER — OPTIONAL
DRAINAGE LAYER (MIN. 30cm THICK WITH HYDRAULIC CONDUCTIVITY OF AT LEAST 1 x 10-3cm/sec)
SECONDARY CLAY LINER — OPTIONAL (MIN. 60cm THICK AND HYDRAULIC CONDUCTIVITY OF 1 x 10-7cm/sec)
NATIVE SOIL

Figure 8-1. Generalized liner and leachate collection system

8.2.2.2.3 Strength and Thickness -- The pipe used in the collection system must be of sufficient strength and thickness to withstand the pressure exerted by the weight of the overlying landfill, waste cover materials, and any equipment to be used on the landfill. The pipe under consideration is either a rigid conduit, such as concrete and cast iron, or a flexible conduit, such as plastic and fiberglass. Because of the probable corrosive properties of the leachate, plastic or fiberglass are usually the materials of choice. However, there are cases where solvents might be generated which would preclude the use of these latter materials.

Leachate collection pipes beneath landfills are generally installed in a protective bed of porous material. Perforations will reduce the effective strength of the pipe that is available to carry loads and resist pipe deflection under loading. In addition, the capacity of buried pipe to support vertical stresses may be limited by buckling and by the circumferential compressive strength of the pipe. Deflection, buckling capacity and compressive strength may be obtained from the pipe manufacturer, but should also be calculated for the specific case. A pipe correctly designed to withstand loading from a landfill can fail from equipment loading received during construction or operation of the landfill. This loading factor is based on the vertical distance between the loaded surface and the top of the pipe. Moving loads cause impact loading which may have twice the effect of stationary loads. These loads must be considered when choosing pipe material and designing the collection system. Appendix V of Reference 3 includes methods to calculate these factors. The leachate collection system should be thick enough to protect the the collection and removal pipes. It should also serve as a sump into which leachate drains and is stored prior to and during removal. The leachate system should have a storage capacity such that leachate drains into the system and is removed fast enough so that the wastes are not standing in leachate. Thus the thickness of the system will depend on factors such as precipitation, control of run-on, and liquid content of the wastes.

8.2.2.2.4 Prevention of Clogging -- The leachate collection and removal system should be overlain by a graded granular or synthetic fabric filter. The purpose of this is to prevent clogging of the pores in the drainage layer of the collection system by infiltration of fine particles from the waste. If a granular filter is used, it is important that the relationship of grain sizes of the filter medium and the drainage layer be appropriate if the filter is to fulfill its function to prevent clogging of the drainage layer and not to contribute to clogging. EPA guidance (Reference 2) specifies a criterion for this purpose which is widely used in construction to prevent clogging (blinding) of drainage media. The criterion was developed by the U.S. Army Corps of Engineers and is used in their engineering manuals. If pipes are used in the leachate collection system, perforations in the pipes should be sized to be compatible with the particle size of the bedding material in the drainage layer. If the perforations are very large compared to the grain size of the bedding material, the latter may wash into the collection system and be removed along with leachate. For additional guidance on the design of the collection and removal system the applicant should refer to References 3, 4, and 5.

8.2.2.3 Guidance to Address the Application Information Requirement --

The applicant should provide detailed plans and specifications for the proposed leachate collection and removal system. A suggested attachment to the permit application is Leachate Collection and Removal System Design. It should contain the raw data, assumptions, calculations, plans and specifications for the system. The basic portion of applications should contain a demonstration of how the proposed system meets the requirements of §264.301(a)(2).

8.2.2.3.1 Overall System Design -- The applicant should provide detailed drawing of the collection and removal systems. These should include construction details sufficient to actually build the system and thus assess its adequacy. Specifications for materials to be used and construction techniques should also be included. The following should be provided:

- Overall system layout, extent, slopes, design of sumps, spacing of pipes, location of pumps or other auxillary equipment

- Specific information on proposed collection pipes including material, size, wall thickness
- Calculations that show compliance with the requirement that no more than 1 foot of leachate will exist above the liner except during storms (See Reference 13).

8.2.2.3.2 Chemical Resistance - The leachate collection system will likely be in the most hostile environment in the landfill. It must continue to operate even though attacked by solutions of hazardous wastes. Thus the compatibility of the pipes, pumps, and other features with the expected leachate is imperative. Data must be provided indicating that the system will survive the chemical attack of the leachate.

Manufacturers' data may be based only on exposure to one type of waste. Better information may come from operating hazardous waste sites handling similar wastes and using the types of materials proposed. Chemical properties of the leachate and the materials should be presented along with results of any long-term exposure tests.

8.2.2.3.3 Strength and Thickness -- The applicant should submit engineering design calculations that demonstrate that the proposed collection system is of sufficient strength and thickness to withstand the pressures exerted by the weight of the overlying landfill, waste cover material, and any equipment to be used in the construction or operation of the landfill. The design calculations should take into account the loads acting on the pipes, the perforation in the pipes, the deflection of the pipes caused by the loads, the buckling capacity of the pipes, and the compressive strength of the pipes.

The thickness of the system should also be shown. Rationale for the design of the thickness should be presented. (See Appendix V of Reference 3).

8.2.2.3.4 Prevention of Clogging -- The applicant should provide information including engineering drawings, specifications, and calculations that demonstrate the ability of the collection system to function without clogging through the scheduled closure of the landfill. Include information about the drainage layer proposed, any proposed filter, and any pipes. See Reference 4 for assistance in the selection of grain sizes for filters or bedding materials.

8.2.3 Liner and Leachate Collection and Removal System Exemption Variance (Not Applicable to Existing Portions)

8.2.3.1 The Federal Requirement --

Section 270.21(b) contains the following:

> (1) ...If an exemption from the requirements for a liner and a leachate collection and removal system is sought as provided by §264.301(b), submit detailed plans and engineering and hydrogeologic reports as appropriate, describing alternate design and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituent into the ground water or surface water at any future time.

Section 264.301(b) states:

> (b) The owner or operator will be exempted from the requirements of paragraph (a) of this section if the Regional Administrator finds, based on a demonstration by the owner or operator, that alternative design and operating practices, together with location characteristics, will prevent the migration of any hazardous constituents (see §264.93) into the ground water or surface at any future time. In deciding whether to grant exemption, the Regional Administrator will consider.

(1) The nature and quantity of the wastes;

(2) The proposed alternate design and operation;

(3) The hydrogeologic setting of the facility, including the attenuative capacity and thickness of the liners and soils present between the landfill and ground water or surface water; and

(4) All other factors which would influence the quality and mobility of the leachate produced and the potential for it to migrate to ground water or surface water.

8.2.3.2 Guidance to Achieve the Part 264 Standard --

The applicant may request a variance from the requirement to install a liner and leachate collection and removal system on new units and new portions of existing units (i.e., everything that is not an existing portion) by providing a thorough and convincing demonstration that the performance goals described in Section 8.2.3 will be achieved without an installed liner system.

8.2.3.3 Guidance to Address the Application Information Requirements --

If an exemption from the liner and leachate collection and removal system requirement is being requested for a new unit, the application should provide:

- Locational determinations relevant to assessing the potential for leachate migration, such as soil permeabilities and attenuation capacities, site geology and geohydrology; and
- A demonstration that facility design, locational aspects and operating practices will prevent the contamination of surface water and ground water at any future time.

A suggested attachment to the permit application is a Report Supporting Request for Exemption from Liner and Leachate Collection and Removal System Requirement.

8.2.4 Control of Run-on

8.2.4.1 The Federal Requirement --

Section 270.21(b)(1) requires that the Part B Application information include:

> (1) Detailed plans and an engineering report describing how the landfill is or will be designed, constructed, operated, and maintained to comply with the requirements of §264.301. This submission must address the following items as specified in §264.301...
>
> (2) Control of run-on.

Section 264.301(c) states that to minimize leachate generation:

> (C) The owner or operator must design, construct, and maintain a run-on control system capable of preventing flow onto the active portion of the landfill during peak discharge from at least a 25-year storm.

8.2.4.2 Guidance to Achieve the Part 264 Standard --

One of the key elements of EPA's strategy for ground-water protection at landfills is a liquids management program. This program is intended to minimize leachate generation in the units, primarily by keeping liquids out of landfills. One aspect for limiting the generation of leachate is the requirement that owners or operators control run-on to the unit. The run-on control system must be capable of preventing flow onto the active portion of landfills during peak discharge from at least a 25-year storm. Methods for estimating peak flow rates from watershed areas have been developed by the U.S. Department of Agriculture, Soil Conservaton Service, National Engineering Handbook (Reference 6), and the U.S. Geological Survey. Additional sources of information are References 7 and 8.

8.2.4.3 Guidance to Address the Application Information Requirement --

To demonstrate that peak flow rates associated with at least a 25-year storm over the tributary watershed will not flow onto the active portion of the landfill, hydrologic, hydraulic, and structure analyses and designs should be completed. A suggested attachment to the permit application is Run-off Control System Design. The following information and analyses should be submitted for review:

- A description of the hydrologic method used to estimate peak flow rates including its source and justification for its use in landfill design;

- All data and input parameters used in conjunction with the selected hydrologic method and their sources;

- All calculations for estimating peak flow rates including a discussion and justification of any necessary assumptions;

- All hydraulic calculations and designs for sizing the necessary collection and conveyance facilities (standard hydraulic techniques for determining flow capacities, including allowance for freeboard, shall be used).

- Structural designs of collection and conveyance facilities and results of all field tests to ensure compatibility with soils and foundation conditions (standard structural design techniques and factor safety and appropriate field tests shall be used).

- A maintenance plan for ensuring the structural integrity of the collection and conveyance facilities along with the plan for restoration and repair in the event of a washout or failure.

8.2.5 Control of Run-off

8.2.5.1 The Federal Requirement --

Section 270.21(b) requires that the Part B Application information include:

> (ii) Detailed plans and an engineering report describing how the landfill is or will be designed, constructed, operated, and maintained to comply with the requirements of §264.301. This submission must address the following items as specified in §264.301...
>
> (3) Control of Run-off.

Section 264.301(d) states that to minimize hazards from run-off of contaminated liquid:

> (d) The owner or operator must design, construct, operate, and maintain a run-off management system to collect and control at least the water volume resulting from a 24-hour, 25-year storm.

8.2.5.2 Guidance to Achieve the Part 264 Standard --

The Agency interprets the run-off regulations in the following ways:

- Run-off from active portions of units will generally be a hazardous waste, because it is presumed to contain leachate. Leachate is generally considered to be a hazardous waste under §261.3(a). However, the permittee has the right to demonstrate that the collected liquid consists only of precipitation run-off for which the mixture rule in §261.3(b)(2) does not apply. Units used to hold hazardous liquids should meet the applicable Part 264 permitting standards (i.e., Subpart K for surface impoundments, Subpart J for tanks, etc.). Run-off quality should be monitored.

- Run-off from fully closed (e.g., capped) units is generally not a hazardous waste, because it has not drained through waste or mixed with leachate. This run-off need not be collected, but it should be managed in a manner designed to protect the final cover as stipulated in §§264.228(b)(4) and 264.310(b)(5). It should be noted, however, that it is useful to monitor closed-area run-off quality to detect leachate seepage through the cap. Units used to hold collected closed-area run-off need not meet the permitting standards associated with the unit type, unless the run-off is a hazardous waste. Run-off from closed landfills should be collected and managed in the same way as active unit run-off.
- Run-off from portions of a facility that are not part of an active landfill (underdeveloped or unassociated areas) need not be collected in the run-off management systems required under §§264.251(d), 264.273(d), and 264.301(d).
- Run-off volume can be calculated using the methods in the U.S. Dept. of Agriculture - Soil Conservation Service, National Handbook 4.
- Collection and conveyance structure designs can be determined using the methods in the U.S.D.A. - SCS, National Engineering Handbook 5: Hydraulics (8).
- The magnitude of the 24-hour, 25-year storm can be determined by using the data available in the National Oceanic and Atmospheric Administration, Technical Publication 40 with Regional revisions.

Of the three types of run-off from landfills (active area, closed area, and undeveloped/unassociated area), the Agency is most concerned with active area control. Precipitation falling on exposed hazardous wastes can dissolve or transport waste constituents. At typical landfills, precipitation run-off and leachate are likely to mix at the toe of the active face or the low point of the trench floor.

If the permittee does not initially manage active area run-off as a hazardous waste, then he has the continuing obligation to determine whether the liquid meets the definition of a hazardous waste. Run-off is not a listed waste because the "derived from" rule in §261.3(c)(2) does not apply. As a result, run-off will only be considered a hazardous waste if it exhibits one of the characteristics associated with hazardous wastes as outlined in 40 CFR Part 261 Subpart C (§261.3) or if it has mixed with leachate or with another hazardous waste. Three considerations, however, suggest that it should be easier for the permittee to assume the run-off to be a hazardous waste. First, the practical burden of conducting the waste analysis is likely to outweigh any ultimate benefit incurred as a result of avoiding initial treatment of the run-off as a hazardous waste. Second, testing itself will be difficult because collected run-off cannot be managed easily in batch form; liquid is added to and removed from run-off collection basins continuously. Third, an initial assumption that run-off is hazardous will save the problem of transferring the liquid from a nonpermitted unit to a permitted unit when the liquid is found to be hazardous.

The collection system must be emptied expeditiously after storms to maintain its capacity. The rate and extent of fluid removal are site-specific factors. It might not be necessary to completely drain the system as long as there is sufficient capacity to collect fluid from the 24-hr, 25-year storm. If the fluid is managed in a Subpart K surface impoundment, the impoundment must be designed to prevent overtopping.

The nature of fluid quality monitoring is also a site-specific matter. If the fluid is not presumed to be a hazardous waste (see above), monitoring must determine whether it meets the definition of a hazardous waste. If the fluid is presumed to be a hazardous waste and managed in appropriate units, monitoring should be based on whatever information is needed to manage those units.

The interim status standards for run-off management at existing facilities are found at §265.302(b) for landfills. The standards for landfills require that run-off from action portions must be collected. If this run-off is a hazardous waste, it must be managed as a hazardous waste.

Run-off from disposal units that are closed under the Interim Status Standards need not be collected.

8.2.5.3 Guidance to Address the Application Information Requirement --

A suggested attachment to the permit application is Run-Off Control System Design. The following information and analyses should be submitted for review:

- A description of the hydrologic method and calculations used to estimate peak flow rates and run-off volumes including justification of necessary assumptions;
- The 24-hour, 25-year rainfall volume used for facility design including the source of the data; all other data and necessary input parameters used in conjunction with the selected hydrologic method and their sources should be documented and described;
- All hydraulic calculations and designs for sizing the necessary collection, conveyance and storage facilities (standard hydraulic techniques for determining flow capacities and storage volumes, including allowances for freeboard, shall be used);

- Structural designs of the collection, conveyance, and storage facilities, and results of all field tests to ensure compatibility with soils and;
- Foundation conditions (standard structural design techniques and factors of safety, and appropriate field tests should be used);
- A maintenance plan for ensuring the structural integrity of the collection, conveyance and storage facilities along with the plan for restoration and repair in the event of a washout or failure.

8.2.6 Management of Units Associated with Run-On and Run-Off Control Systems

8.2.6.1 The Federal Requirement --

Section 270.21(b) requires that the Part B Application information include:

> Detailed plans and an engineering report describing how the landfill is or will be designed, constructed, operated, and maintained to comply with the requirements of §264.301. This submission must address the following items as specified in §264.301...
>
> (4) Management of collection and holding facilities associated with run-on and run-off control systems...;

Section 264.301(e) states that:

> Collection and holding facilities (e.g., tanks or basins) associated with run-on and run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system.

8.2.6.2 Guidance to Achieve the Part 264 Standard --

Section 264.301(e) states that collection and holding facilities associated with run-on and run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain the design capacity of the system. The specified design capacity is that capacity necessary to collect and control the water volume resulting from a 24-hour, 25-year storm. The system may be designed to meet the above requirements or by designing it for a volume in excess of the 24-hour, 25-year storm capacity Where additional storage capacity is necessary to allow reuse or delayed disposal of collected wastes, it can be separately provided by tanks or additional surface impoundments.

The applicant is reminded that run-off from the active area of the landfill should generally be considered hazardous. This will require management of this run-off in permitted treatment, storage, or disposal facilities.

8.2.6.3 Guidance to Address the Application Information Request --

A suggested attachment to the permit application is Plan for Management of Units Associated with Run-On and Run-Off Control. The following information should be submitted on management of run-on and run-off:

- A plan for emptying collection or holding facilities associated with run-on and run-off management systems to maintain the capacity of the system;
- An estimation of the length of time it would take to empty the holding facilities;
- A description of the method to be used for collected run-off disposal, such as treatment and discharge, evaporation, etc. The description should address any environmental concerns associated with the disposal method;
- A description of the methods to be used to monitor run-off quality.

8.2.7 Management of Wind Dispersal

8.2.7.1 The Federal Requirement --

Section 270.21(b) requires that the Part B application information include:

> Detailed plans and an engineering report describing how the landfill is or will be designed, constructed, operated, and maintained to comply with the requirements of §264.301. This submission must address the following items as specified in §264.301...
>
> (5) Control of wind dispersal of particulate matter, where applicable

Section 264.301(f) states that:

> If the landfill contains any particulate matter which may be subject to wind dispersal, the owner or operator must cover or otherwise manage the landfill to control wind dispersal.

8.2.7.2 Guidance to Achieve the Part 264 Standard --

The degree of wind erosion of landfill wastes depends on the waste type, moisture content, wind velocity, and surface geometry. Particulate emissions caused by wind erosion of landfilled waste materials or soils covering a landfill can be minimized by use of physical, chemical, or vegetative stabilization. Physical stabilization methods function to cover the exposed surfaces with a material that prevents the wind from disturbing the surface particles. A common stabilizing material is soil used as an intermediate cover over the exposed surface of the waste after the daily operations.

Chemical stabilizers can be added to cover soils to reduce wind erosion. Many of the compounds are proprietary developments, and their properties are difficult to evaluate without actual site-specific field testing. In selecting a soil additive, one should consider effectiveness, stability, ease of application, cost, safety, and environmental impact. Most chemical stabilizers only provide dust suppression for a limited period of time, generally no more than a few months; thereafter, a more permanent solution is needed. This solution generally consists of the establishment of a vegetative cover. Information on chemical soil stabilizing materials and their characteristics is available from References 9, 10, and 11.

Vegetation can be effectively used to stabilize a variety of exposed soil surfaces and is used primarily in the final cover. This method of stabilization not only provides permanent dust suppression but makes the site more aesthetically acceptable. The control efficiency of this method varies considerably with the amount and type of cover established on the site. Efficiencies of nearly 100 percent should be achieved with complete vegetative covering on some sites.

Finally, windbreaks such as tree lines or fences may assist in minimizing wind dispersal of particulates. Such measures alone, however, often are not adequate, particularly when large areas are involved. The effectiveness of windbreaks should be evaluated on a case-by-case basis.

8.2.7.3 Guidance to Address the Application Information Requirement --

The applicant would assess the potential for wind dispersal. This may be based on factors such as type of waste(s) disposed, predominant wind direction and velocity, local topography, windbreaks, and operational procedures. The approach used in this assessment and the results should be included in the basic portion of the application.

If the assessment indicates a potential for wind dispersal, a control plan must be developed. A suggested attachment to the permit application is Wind Dispersal Flow Control Plan.

The applicant should submit the following information on wind dispersal control:

- A description of the method(s) proposed for controlling wind dispersal. Include such considerations as the siting of the landfill; the use of water sprays, dust suppressants other than water, stabilizers, windbreaks, and enclosures (if they are used as landfill management techniques for control of wind dispersal).
- Data supporting the effectiveness of the proposed wind dispersal control technique(s).

8.2.8 Ground-Water Protection Exemption for Double-Lined Landfills

8.2.8.1 The Federal Requirement --

If the applicant desires exemption from the ground-water protection standards because he proposes a double-lined landfill, section 270.21(c) requires the Part B application information include:

> (c) If an exemption from Subpart F of Part 264 is sought, as provided by §264.302(a), the owner or operator must submit detailed plans and an engineering report explaining the location of the saturated zone in relation to the landfill, the design of a double-liner system that incorporates a leak detection system between the liners, and a leachate collection and removal system above the liners;

Section 264.302(a) states:

> The owner or operator of a double-lined landfill is not subject to regulations under Subpart F of this part if the following conditions are met:
>
> (1) The landfill (including its underlying liners) must be located entirely above the seasonal high water table.
>
> (2) The landfill must be underlain by two liners which are designed and constructed in a manner to prevent the migration of liquids into or out of the space between the liners. Both liners must meet all the specifications of 264.301(a)(1).
>
> (3) A leak detection system must be designed, constructed, maintained, and operated between the liners to detect any migration of liquid into the space between the liner.
>
> (4) The landfill must have a leachate collection and removal system above the top liner that is designed, constructed, maintained, and operated in accordance with §264.301(a)(2).

8.2.8.2 Guidance to Achieve the Part 264 Standard --

The design and operating standards contain special sets of standards for landfills with double liners and leak detection systems. Compliance with these standards is not mandatory. However, if an applicant voluntarily applies for and is issued a permit to comply with these special standards (in addition to the other standards generally applicable to these units), he is not subject to the ground-water protection regulations contained in Subpart F. These special standards require that there be two synthetic liners underlying the unit and a leak detection system between the two liners.

The leak detection system enables the permittee of the landfill to detect whether any liquid has entered into the space between the liners. This is the means to determine if the upper liner has failed or is leaking. It serves as a substitute for the ground-water monitoring system.

Because a permit written for a double-lined unit does not contain any ground-water detection monitoring requirements, the permittee must repair or replace the leaking liner if liquid is found in the leak detection system. Therefore, EPA suggests that those who anticipate retrofitting problems in attempting to repair or replace leaking liners should consider requesting that a detection ground-water monitoring program be established in their permits in accordance with the requirement of §264.98, as contingent requirements. Such requirements would be automatically triggered in the event of a leak, but would not have to be complied with until such a leak occurred. The permit would specify well placement, detection parameters to be monitored, and the frequency of monitoring. If a leak in the top liner occurred, the permittee would then install the wells and begin a ground-water monitoring program in accordance with a schedule set forth in the permit.

8.2.8.3 Guidance to Address the Application Information Requirement --

A landfill must not be located within the saturated zone in order to qualify for the exemption described in §264.302(a). Many fine-grained geologic formations may not meet the characteristics of an aquifer, but may be nonetheless saturated. A landfill constructed in such a formation would be within the ground water table, and could not qualify for the exemption.

The applicant should submit the following information if the ground-water monitoring program exemption is being applied for:

- A demonstration that the landfill and its underlying liners will be located entirely above the seasonal high ground water table. The applicant should refer to section 9.3 of this manual for guidance on how to describe the hydrogeologic characteristics of the facility's location.

- A demonstration that both liners satisfy the requirements of §264.301(a)(1). The applicant should refer to Section 8.2.1 for guidance on how to demonstrate compliance with this standard for each liner. For these cases in which two different types of liner material are to be used, a liner integrity analysis (i.e., waste-liner compatibility test) for both liners must be submitted. .

- A demonstration that the leak detection system between the two liners will be designed, constructed, maintained, and operated to detect any migration of liquid into the space between the liners. EPA recommends that the leak detection system resemble the leachate collection and removal system. If the top liner leaks, a leachate collection and removal system will be present beneath it for immediate operation. The applicant can refer to Section 8.2.2 for guidance on leachate collection and removal system design.

- A demonstration that the leachate collection and removal system above the top liner satisfies the standard in §264.301(a)(2). The applicant can refer to section 8.2.2 for guidance on collection and removal system design.

A suggested attachment to the permit application is Report Supporting Request for Exemption from Ground-Water Protection Requirements for Double-Lined Landfills.

8.2.9 Inspections

8.2.9.1 The Federal Requirement --

Section 270.21(d) requires that the Part B Application include:

> (i) A description of how each landfill, including the liner and cover systems, will be inspected in order to meet the requirements of §264.303 (a) and (b). This information should be included in the inspection plan submitted under 270.14(b)(5).

Section 264.303(a) states:

> (a) During construction or installation, liners (except in the case of existing portions of landfills exempt from §264.221(a) and cover systems (e.g., membranes, sheets, or coatings) must be inspected for uniformity, damage, and imperfections (e.g., holes, cracks, thin spots, or foreign materials). Immediately after construction or installation:
>
> (1) Synthetic liners and covers must be inspected to ensure tight seams and joints and the absence of tears, punctures, or blisters; and
>
> (2) Soil-based and admixed liners and covers must be inspected for imperfections including lenses, cracks, channels, root holes, or other structural non-uniformities that may cause an increase in the permeability of the liner or cover.

Section 264.303(b) states:

> (b) While a landfill is in operation, it must be inspected weekly and after storms to detect evidence of any of the following:
>
> (1) Deterioration, malfunctions, or improper operation of run-on and run-off control systems;
>
> (2) The presence of liquids in leak detection systems, where installed to comply with §264.302;
>
> (3) Proper functioning of wind dispersal control systems, where present; and
>
> (4) The presence of leachate in and the proper functioning of leachate collection and removal systems, where present.

8.2.9.2 Guidance to Achieve the 264 Standard --

8.2.9.2.1 Liner and Membrane Inspections

Synthetic liner and cover systems must be inspected during construction and installation for uniformity, damage and imperfections, and after installation to insure tightness of seams and joints and absence of tears, puctures, or blisters. Soil-based and admixed liners and covers must be inspected for imperfections including lenses, cracks, channels, root holes or other structural non-uniformities that may adversely affect the permeability, strength, or other engineering properties of the liner or cover. The applicant should consult the EPA publication on liners (Reference 3) for information on specific inspection needs and objectives for various liners. Information on evaluating cover systems is also available in Reference 12.

An effective quality control program will form the basis for the inspection plan for the installation and construction of liners. The applicant should propose a Liner Installation Quality Control Program (QC) that addresses the proposed methods of liner inspection, testing and documentation. The QC Program may be developed, in part, from manufacturer's standard inspection procedures. For example, for a synthetic liner, it should include, but not be limited to, the following specific provisions:

(1) The permittee will designate a field representative (QC Manager) with sole responsibility for inspection and approval of liner work. For large projects, the permittee should provide a sufficient number of personnel to assist the QC Manager to achieve the objectives of the QC Program;

(2) QC Program should include assurance that the following objectives are met:

  - The construction specifications required in the permit are fully implemented;
  - Subgrade preparation is consistent with requirements for synthetic liner membranes;

- Handling of liner materials is performed in accordance with manufacturer's recommended procedures;

- Manufactured liner panels, upon arrival at the project site, are free of product defects and damage resulting from shipping;

- Fabricated seams of prefabricated sheet membranes are tested by airlance, vacuum or other suitable means to determine location of defects;

- Liquid-applied membranes, adhesives, and solvents are delivered in sealed containers and are used in accordance with the manufacturer's recommendations;

- Contractor's tools are consistent with manufacturer's recommendations; sharp instruments such as pointed scissors are not allowed;

- Field seams constructed by adhesive, heat, welding or other means are tested by airlance, vacuum, ultrasonic method or by any combination of methods to determine the location of defects;

- Placement of soil and protective cover is accomplished so that the soil is free of deleterious materials, and in such a manner that damage is not caused to the liner membrane by disposal operations;

- Samples of liner material, fabrication seams and field seams are taken routinely in sufficient number to verify the quality of workmanship of the completed work;

- Laboratory testing of field samples is conducted in accordance with ASTM standards and procedures for synthetic liner membranes. Results should be reviewed by the QC Manager and corrective action taken if materials and seams do not meet minimum specified strengths. The permittee should notify the Regional Administrator of such corrective action and make all test results available for review upon request.

- Documentation of all phases of the QC Program should be prepared by the permittee for record purposes. Daily reports should be maintained by the QC Manager describing observations, activities, weather, production, contractor's equipment, and work force and specific problems. Deviations from standard construction procedures by the contractor, corrective measures and changes in design should be fully documented. Location of field samples and laboratory test results should be made a part of program documentation.

Soil-based and admixed liners and covers must be inspected and tested to ensure that they are properly constructed according to the approved design. The test data should consist of strength, permeability and other material properties of samples representative of the liner or cover to be used in construction. Actual waste fluid or equivalent should be used whenever appropriate in the tests.

To ensure that the liner and cover system are constructed according to the approved design and specifications, and to ensure uniformity, absence of damage and imperfections, an independent test lab and inspector supervised by a qualified, registered engineer should be present at all phases of construction and installation to monitor and test the materials as they are placed. Non-destructive or destructive sampling and testing should be performed on a random basis in accordance with established acceptable standards. In destructive sampling and testing, the areas sampled or tested should be restored to original condition immediately after sampling or testing. All test results and other pertinent data, such as location, elevation, date, climatic conditions, personnel, etc. should be documented and kept on record.

8.2.9.2.2 Operational Inspections

In addition to inspections during construction and installation, qualified personnel must make inspections of a landfill while it is in operation. These inspections must be conducted weekly and after storms. A detailed written schedule should be developed for inspection of: (a) run-on and run-off control systems, (b) leak detection systems, (c) wind dispersal control system, and (d) leachate collection and removal system.

The inspection records should include the maintenance and calibration records of any control systems, leak detection systems, and leachate collection and removal systems. The amount of leachate present in the collection and removal system should be recorded. All information from each inspection should be documented and kept on record for EPA review.

The applicant is advised that additional general inspection requirements are delineated in §264.15(b) of the general facility standards. The corresponding permit information requirements for these requirements are provided in §270.14(b)(5). Guidance on these overall inspection requirements is provided in the Permit Applicants' Guidance Manual for General Facility Standards, Reference 1.

8.2.9.3 Guidance to Address the Application Information Requirement --

The following information on inspection should be submitted with the permit application. The applicant should include this information in the overall Facility Inspection Plan as required under §270.14(b)(5). Two suggested attachments within the Facility Inspection Plan submitted with the permit application are a Liner and Membrane Construction Inspection Plan and an Operation Inspection Plan.

Liner and Membrane Inspection Plan

- Describe procedures, including a quality control program, for inspecting synthetic liners and covers during construction and installation. The applicant should address all inspection needs discussed above for synthetic liners and covers.

- Describe procedures, including a quality control program, for inspecting soil-based and admixed liners and covers during cnstruction and installation. The applica[illegible]hould address all inspection needs discussed [illegible]ove for soil-based and admixed liners and covers.

Operation Inspection Plan

- Describe the procedures for inspecting weekly and after storms for detection of:
    - -- deterioration, malfunction, or improper operation of run-on and run-off control systems;
    - -- presence of liquids in the leak detection system, where installed to comply with §264.302;
    - -- proper functioning of wind dispersal control systems; and
    - -- presence of leachate in and the proper functioning of leachate collection and removal system, where present.

- Indicate who will conduct these inspections, how the inspection records will be maintained, and what conditions will trigger a response.

8.3 CLOSURE

8.3.1 The Federal Requirement

Section 270.21(e) requires that the Part B application include:

(e) Detailed plans and an engineering report describing the final cover which will be applied to each landfill or landfill cell at closure in accordance with §264.310(a)... This information should be included in the closure and post closure plans submitted under 270.14(b)(13).

Section 264.310(a) requires that:

(a) At final closure of the landfill or upon closure of any cell, the owner or operator must cover the landfill or cell with a final cover designed and constructed to:

(1) Provide long-term minimization of migration of liquids through the closed landfill;

(2) Function with minimum maintenance;

(3) Promote drainage and minimize erosion or abrasion of the cover;

(4) Accommodate settling and subsidence so that the cover's integrity is maintained; and

(5) Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

8.3.2 Guidance to Achieve the Part 264 Standard --

A final cover must be placed on the unit at closure. The final cover should be placed as each cell is closed or, preferably, as the filling of the cell progresses. In some cases, such as when operations are conducted in the multiple lifts, final cover cannot be applied until the lift or layer is filled. Less substantial, interim cover should be applied to cells other than the topmost in multiple-lift landfills.

The Agency believes that a three-layer final cover (cap) will adequately minimize infiltration of precipitation, which is the primary purpose of the final cover. The final cover acts to minimize infiltration by causing precipitation to run off through use of slopes, drainage layers, and impermeable and slightly permeable barriers. Other functions of the final cover include prevention of contamination of surface run-off, prevention of wind dispersal of hazardous wastes, and prevention of direct contact with hazardous wastes by people and animals straying onto the site. For guidance on an acceptable final cover, the applicant should refer to Reference 4.

To prevent the "bathtub effect, i.e., to prevent the landfill from filling with leachate after closure when the leachate collection system ceases to function, the final cover must be no more permeable than the most impermeable component of the liner system (or of the underlying soils). In this way, no more precipitation is allowed to infiltrate the cell than can escape through the bottom liner. Prevention of the bathtub effect is important to eliminate the possibility of surface overflow or migration through porous surface strata.

The final cover should be designed to accommodate pressures resulting from gas generated within the wastes. The cover should either withstand these pressures and retain the gases; or preferably, the gases should be safely vented to the atmosphere. The design shall include a discussion of the potential for gas generation and include features to manage the gas. See the discussion about gas in Section 8.2.1.2.

In some instances, an entire landfill will not be completely filled and ready for final cover at the same time. The Agency suggests that, when possible, portions of a landfill be completed to final grade and the final cover installed. This will provide the best protection to the site as early as possible.

When this is not possible or economically feasible, an intermediate cover should be installed over completed portions or portions that will not receive additional waste for some time. An impermeable cap is not required; however, the intermediate cover should minimize infiltration and run-off. Several feet of compacted soil planted with an intermediate vegetative cover are suggested. This intermediate cover may also serve as a surcharge to accelerate differential settlement of the landfill compared to a site without a surcharge, this may result in a more stable site upon which to install the final cover.

8.3.3 Guidance to Address the Application Information Requirement

The applicant should present an analysis of the final cover design in the basic portion of the application. This final cover analysis should demonstrate that the proposed final cover meets the requirements of §264.310(a). Details of the design including drawings, specifications, calculations, etc. should be attached. A suggested attachment to the permit application is Cover Design.

The final cover analysis should describe how the following factors are provided for, with details included in the attached Cover Design:

- Minimization of Liquid Migration. If a design other than that defined by EPA in Reference 4 is used, submit engineering calculations to show that the proposed cover will provide long-term minimization of migration of liquids through the closed landfill. The applicant should demonstrate that infiltration is equivalent to or less than the cover design provided in RCRA Guidance Document: Landfill Design - Liner Systems and Final Cover 4. The use of the H.E.L.P. model is suggested (See Reference 13).

- Maintenance Needs. Demonstrate that the cover system will function effectively with minimum maintenance. For example, data should be provided showing that the vegetative cover crop is adapted to regional conditions and is able to thrive with minimal irrigation or fertilization.

- Drainage and Erosion. Provide the following information:

  - Data demonstrating that the proposed slopes will not cause significant erosion of the final cover. The USDA Universal Soil Loss Equation may be used in this demonstration. This equation is described in EPA Reference 4 and should be used when proposed slopes do not conform to the Reference 4 policy.

  - A description of the material in the drainage layer of the final cover that will be used including the type and permeability of the material.

  - Engineering calculations and designs showing that precipitation will drain freely to the side. (Note: If the applicant proposes the design recommended by EPA (4), this information does not have to be submitted).

  - Data addressing the potential for clogging of the drainage layer. The use of the Army Corp of Engineers clogging criteria formulas described in Reference 4 is recommended.

- Settlement and Subsidence. Submit the following information:

  - Data addressing the potential for settlement due to compression of the foundation. This analysis should consider immediate settlement, primary consolidation, secondary consolidation and creep, and liquifaction. The immediate settlement estimate should consider the strength and elastic properties of the foundation soils. The primary and secondary consolidation should be estimated based on consolidation tests performed on undisturbed soil samples. Settlement due to creep or liquifaction should also be estimated for the slopes and bottom of a landfill, if the subsurface soils are susceptible to creep or if there is a potential for liquifaction of the foundation soils.

-- Data addressing the potential for settlement due to compression of the liner. This analysis should consider the same factors as described above for foundation compression. Analysis of settlement due to compression of the liner may be similar to that for the foundation, except that liquifaction potential for the filter and drain materials above or underlying the liner should also be considered in the analysis.

-- Data addressing the potential for settlement due to compression of waste in the landfill, the following factors should be included in the analysis: dewatering of waste material; biological oxidation of organics; and chemical conversion of solids to dissolved waste materials.

-- Analysis of settlement due to dewatering of waste material should consider the evaporation, drainage conditions, and fluidity and homogeneity of the waste material. The settlement due to consolidation under the weight of the waste and the cover may be analyzed based on consolidation test results performed on undisturbed representative waste sediment samples in the landfill. Both primary and secondary consolidation settlement shall be estimated. For nonhomogeneous, unsaturated, compacted or uncompacted waste sediments, the settlement analysis should take into consideration the collapsing of voids within the waste material. To accommodate the amount of settlement, the placement of the cover should be scheduled accordingly.

-- Information addressing the effects of freeze/thaw on the integrity of the proposed cover.

-- Data on the effects of subsidence/settlement on the ability of the final cover to minimize infiltration.

- Permeability Documentation. Clearly document that the final cover has a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present. This item can simply point out permeability data for the liner and cover systems attached to application.

- Freeze/Thaw Effects. Discussion of the effects on the final cover due to freeze/thaw. The applicant should demonstrate that the synthetic liner in the final cover is located wholly below the average depth of frost penetration in the specific area.

The attached Cover Design should contain the raw data, assumptions, calculations, drawings, and specifications necessary to support the analysis of the final cover's ability to meet the requirements. The Cover Design should include:

- Detailed drawing(s) of the proposed layers in the final cover (including such items as the thickness of each layer, the slope of each layer, and the dimensions of the cover system);

- The common name, species and variety of the cover crop to be established;

- A description of the synthetic liner that will be used in the final cover including the type of synthetic liner, its chemical properties, and the manufacturer's specifications of its physical strength and thickness. An explanation of why the synthetic liner was selected should also be provided.

- Descriptions of any protective materials placed above and below the synthetic liner and specification of the type of material.

- Characteristics of any clay layer placed beneath the liner in the final cover (including thickness and permeability).

- The construction plans for the clay layer and the sequence of the lifts.

- Analysis of surface drainage and discussion of erosion control

- Installation procedures for each layer of the cover with emphasis on installation of the synthetic membrane

- Specifications for the drainage layer including hydraulic conductivity

8.4 POST-CLOSURE

8.4.1 The Federal Requirement

Section 270.21(e) requires that the Part B applicant include:

> ... a description of how each landfill will be maintained and monitored after closure in accordance with §264.310(b). This information should be included in the closure and post-closure plans submitted under §270.14(b)(13).

Section 264.310(b) states that:

> After final closure, the owner or operator must comply with all post-closure requirements contained in §§264.117-264.120, including maintenance and monitoring throughout the post-closure care period (specified in the permit under §264.117). The owner or operator must:
>
> (1) Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events;
>
> (2) Maintain and monitor the leak detection system in accordance with §264.302, where such a system is present between double liner systems;
>
> (3) Continue to operate the leachate collection and removal system until leachate is no longer detected;
>
> (4) Maintain and monitor the ground-water monitoring system and comply with all other applicable requirements of Subpart F of this Part;
>
> (5) Prevent run-on and run-off from eroding or otherwise damaging the final cover; and

(6) Protect and maintain surveyed benchmarks used in complying with §264.309.

8.4.2 Guidance to Achieve the Part 264 Standard

Post-closure care must be continued for 30 years after the date of completing closure. Post-closure care consists of maintaining the final cover and performing monitoring and response as necessary, to prevent adverse impacts on human health and on the environment. The frequency of monitoring and maintenance activities should be balanced with the specific factors considered in the initial closure design (i.e., climate, waste type, soil, vegetation, etc.).

8.4.3 Guidance to Address the Application Information Requirement

The applicant should submit a description of planned activities that will be conducted in order to comply with the §264.310(b) post-closure care requirements. This information should be included in the Post-Closure Care Plan, submitted as an attachment to the permit application. The description should address, at a minimum, the following activities:

- Frequency of inspection of the closed facility and what will be inspected.
- Operation of leachate collection and removal system until leachate is no longer observed.
- Maintenance of the final cover (e.g. reestablishing the vegetative layer, and assessment of subsidence).
- Maintenance and monitoring of leak detection system, groundwater monitoring (frequency and list of constituents to be monitored).
- Maintenance and inspection of run-on and run-off controls in order to prevent erosion of and/or damage to the final cover.

- Maintenance of surveyed benchmarks used in complying with §264.309.

8.5 SPECIAL REQUIREMENTS FOR IGNITABLE OR REACTIVE WASTES

8.5.1 The Federal Requirement

Section 270.21(f) requires that the Part B application include:

> If ignitable or reactive wastes will be landfilled, an explanation of how the requirements of §264.312 will be complied with;

Facility Standard 264.312 states:

> (a) Except as provided in paragraph (b) of this section, and in §264.316, ignitable or reactive waste must not be placed in a landfill, unless the waste is treated, rendered, or mixed before or immediately after placement in a landfill so that:
>
> (1) The resulting waste, mixture, or dissolution of material no longer meets the definition of ignitable or reactive waste under §§261.21 or 261.23 of this Chapter, and
>
> (2) Section 264.17(b) is complied with.
>
> (b) Ignitable wastes in containers may be landfilled without meeting the requirements of paragraph (a) of this section, provided that the wastes are disposed of in such a way that they are protected from any material or conditions which may cause them to ignite. At a minimum, ignitable wastes must be disposed of in non-leaking containers which are carefully handled and placed so as to avoid heat, sparks, rupture, or any other condition that might cause ignition of the wastes; must be covered daily with soil or other noncombustible material to minimize the potential for ignition of wastes; and must not be disposed of in cells that contain or will contain other wastes which may generate heat sufficient to cause ignition of the waste.

8.5.2 Guidance to Achieve the Part 264 Standard

The regulations require the permittee to take precautions to prevent accidental ignition of ignitable wastes and protect the waste from sources of ignition. The Agency will allow the management of ignitable wastes in landfills if the wastes are protected from any material or conditions that may cause them to ignite. The restrictions on liquid wastes in general, coupled with the requirements that ignitable wastes be in containers when landfilled, as a practical matter, greatly restrict the landfilling of ignitable wastes.

8.5.3 Guidance to Address the Application Information Requirement

The applicant should submit the information defined in Option 1 or Option 2 below. A suggested attachment to the permit application is Ignitable and/or Reactive Waste Management Plan(s).

Option 1

- Description of how ignitable or reactive wastes will be identified when received at the site (should also be included in the Waste Analysis Plan).
- Description of the procedure for treating, or mixing the ignitable or reactive wastes before or immediately after placement in the landfill.
- Results of laboratory or field experiments that demonstrate that, after treatment or mixing and placement in the landfill, the reactive or ignitable waste will be rendered non-reactive or non-ignitable.
- Description of how §264.17(b) will be complied with (i.e., describe what precautions will be taken to prevent reactions which: (1) generate extreme heat or pressure, fire or explosions, or violent reactions; (2) produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment; (3) produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosion; (4) damage the structural integrity of the device or facility, and (5) through other like means threaten human health or the environment).

Option 2 (applicable only to ignitable wastes in containers).

- If ignitable wastes in containers are landfilled, a description of how the wastes will be disposed of so that they are protected from any material or conditions that may cause them to ignite. This description should include handling procedures, the daily cover characteristics, and characteristics of the other wastes disposed in the same cell.

Additional guidance on the ignitable and reactive waste information needs is provided in Reference 1.

8.6. SPECIAL REQUIREMENTS FOR INCOMPATIBLE WASTES

8.6.1 The Federal Requirement

Section 270.21(g) requires that the Part B application include:

> (g) If incompatible wastes, or incompatible wastes and materials will be landfilled, an explanation of how §264.313 will be complied with:

Section 264.313 states:

> Incompatible wastes, or incompatible wastes and materials, (see Appendix V of this part for examples) must not be placed in the same landfill cell unless §264.17(b) is complied with.

8.6.2 Guidance to Achieve the Part 264 Standard

The potential dangers from the mixing of incompatible wastes and materials include extreme heat, fire, explosion, violent reaction, production of toxic mists, fumes, dusts, or gases, and damage to the structural integrity of the landfill. Clearly, the potential impacts on human health or the environment which could result from such conditions must be avoided. Additional guidance on incompatibility can be found in References 14 and 15.

8.6.3 Guidance to Address the Application Information Requirement

A suggested attachment to the permit application is Management Plan for Incompatible Wastes. The applicant should first determine whether incompatible wastes and/or materials will be landfilled by following the subsequent steps and providing the information in the permit application:

- Review the lists of incompatible wastes in Section 7.9.2 and identify any that may be received
- Identify other wastes to be disposed that are not shown in Section 7.9.2.
- Determine if any mixture of these wastes or materials is incompatible and identify the wastes and nature of the incompatibility. Note: if available, the applicant may use Reference 14, A Method for Determining Compatibility of Wastes as an aid in determining compatibility of wastes; however, this document should be used with the caution noted in Section 3.4.3.2 of this manual.

If incompatible wastes and/or materials will be landfilled, the applicant must describe:

- Methods for identifying these wastes as they are received at the site
- Step-by-step procedures for managing incompatible wastes or material to prevent undesirable reactions or effects defined in §264.17(b);
- Laboratory or field data demonstrating that incompatible wastes can be safely managed at the landfill using the proposed procedures.

8.7 SPECIAL REQUIREMENTS FOR LIQUID WASTE

8.7.1 The Federal Requirement

Section 270.21(h) requires that the Part B application include:

If bulk or non-containerized liquid waste or waste containing free liquids is to be landfilled, an explanation of how the requirements of §264.314 will be complied with;

Section 264.314 states:

> (a) Bulk or non-containerized liquid waste or waste containing free liquids must not be placed in a landfill unless:
>
> (1) The landfill has a liner and leachate collection and removal system that meet the requirements of §264.301(a); or
>
> (2) Before disposal, the liquid waste or waste containing free liquids is treated or stabilized, chemically or physically (e.g., by mixing with an absorbent solid), so that free liquids are no longer present.
>
> (b) Containers holding free liquids must not be placed in a landfill unless:
>
> (1) All free-standing liquid: (a) has been removed by decanting, or other methods; (ii) has been mixed with absorbent or solidified so that free-standing liquid is no longer observed; or (iii) has been otherwise eliminated; or
>
> (2) The container is very small, such as an ampule; or
>
> (3) The container is designed to hold free liquids for use other than storage, such as a battery or capacitor; or
>
> (4) The container is a lab pack as defined in §264.316 and is disposed of in accordance with §254.316.

8.7.2 Guidance to Achieve the Part 264 Standard

Section 264.314 restricts the disposal of liquids in landfills. To accept bulk or non-containerized liquids, the landfill must have a liner and leachate collection and removal system which meets the requirements of §264.301(a), or the liquid or waste containing free liquids must be treated or stabilized to remove free liquids before disposal. Physical processes, such as mixing with an absorbent solid, will remove free liquids. Chemical treatment processes, such as stabilization/ solidification will also remove free liquids from the waste. Several stabilization/solidification methods are currently available or under development. Detailed information concerning each of these methods can be found in Reference 16.

EPA interprets "before disposal" for the treatment/ stabilization of liquids in §264.314(a) and (b) to mean that these processes are completed outside the landfill. Thus no bulk or non-containerized liquids are to enter a landfill unless the unit has a liner and leachate collection and removal system. The above interpretation and regulations apply to both hazardous and non-hazardous liquids and waste containers entering a Part B permitted landfill.

The EPA interprets free-standing liquids as those that form distinct pools or layers within a container. Included in the definition are those covered with a scum or film, or those liquids known to accumulate in layers or pools below the surface of a container. Where it is difficult to determine whether a given substance that separates out from the waste is a freestanding liquid, the EPA recommends that the paint filter test described in 46 FR 8311, February 25, 1982, proposed rules be used.

Permittees are not required to open and inspect all containers if they can demonstrate that such practices assume reasonable compliance. For example, where the landfill receives a batch of containerized wastes and has evidence that the content among containers does not vary significantly, and does not contain free-standing liquid, a representative sample of the containers may be opened and inspected.

Section 264.314(b)(4), concerning lab packs, is discussed in Section 8.9

8.7.3 Guidance to Address the Application Information Requirement

The applicant must determine whether bulk or non-containerized liquids will be received at the landfill. Procedures to accomplish this should be included in the overall Waste Management Plan.

If bulk or non-containerized liquid waste or waste containing free liquids are proposed to be placed in the landfill, the applicant should submit the following information in (a) or (b) below. A suggested attachment to permit the application is Liquid Waste Management Plan.

(a) Information demonstrating that the landfill has (or will have) a liner and leachate collection and removal system that meet the requirement of §264.301(a). See Sections 8.2.1 and 8.2.2 for a discussion of specific information that should be included to address §264.301(a). (If this information is presented elsewhere in the application, the applicant should simply note this here).

(b) Data demonstrating that the liquid waste or waste containing free liquids is treated or stabilized, chemically or physically, so that free liquids are no longer present. Describe the treatment or stabilization process in detail.

If containers holding free liquids are proposed to be landfilled, the applicant should submit as an attachment a Liquid Waste Management Plan for Containers. This plan should be coordinated with the overall Waste Management Plan and include:

- Descriptions showing that the free standing liquids will be removed by decanting or other methods, mixed with absorbent or solidified so that free-standing liquids are no longer observed, or otherwise eliminated. The applicant should identify any test methods that will be used to determine the presence or absence of free standing liquids, unless the applicant provides:
- Documentation that the containers will be very small, such as an ampule or;
- Data demonstrating that the containers are designed to hold free liquids for use other than storage, such as battery or capacitor or;
- Information showing that the containers will be lab packs as defined in §264.316. (Additional information on lab packs must also be submitted; see Section 8.9 of this manual.

8.8 SPECIAL REQUIREMENTS FOR CONTAINERS

8.8.1 The Federal Requirement

Section 270.21(i) requires that the Part B application include:

> If containers of hazardous waste are to be landfilled, an explanation of how the requirements of §§264.315 or 264.316, as applicable, will be complied with.

Section 264.315 states:

> Unless they are very small, such as an ampule, containers must be either:
>
> (a) At least 90 percent full when placed in the landfill; or

(b) Crushed, shredded, or similarly reduced in volume to the maximum practical extent before burial in the landfill.

8.8.2 Guidance to Achieve the Part 264 Standard

The purpose of the §264.315 standard is to minimize subsidence in the landfill resulting from decaying containers having void spaces. The EPA believes by allowing only full containers or those that have been crushed or otherwise reduced in void space to be placed in a landfill, disruptive subsidence of the final cover resulting from the placement of partially filled containers in landfills can be avoided. Container crushing equipment is readily available.

Those permittees having containers which are partially filled may either (a) fill them to greater than 90 percent of their capacity, (b) empty them and then crush or shred them to the maximum extent practical, or, (c) to the extent technology and safety allow, reduce the volume of the partially full containers. The provision allowing landfilling of containers that are 90 percent full means that there could be about 4 inches of void space in the typical 55-gallon drum. Very small containers, such as ampules, were exempted because these containers have void spaces which would not significantly affect the stability of a landfill.

8.8.3 Guidance to Address the Application Information Requirement

The applicant should submit the information in (a), (b), or (c) below, if containers of hazardous waste are proposed to be landfilled. A suggested attachment to the permit application is Management Plan for Containers.

(a) Documentation that the containers will be very small, such as an ampule;

(b) Data demonstrating that the containers will be at least 90 percent full when placed in the landfill. Also, describe the procedure for inspection or verification in the Waste Analysis Plan.

(c) Description of procedure for crushing, shredding, or similarly reducing the containers in volume to the maximum practical extent before burial in the landfill.

8.9 DISPOSAL OF SMALL CONTAINERS IN OVERPACKED DRUMS (LAB PACKS)

8.9.1 The Federal Requirement

Section 270.21(i) requires that the Part B application include:

> (ix) If containers of hazardous waste are to be landfilled, an explanation of how the requirements of §§264.315 or 264.316, as applicable, will be complied with.

Section 264.316 states:

> Small containers of hazardous waste in overpacked drums (lab packs) may be placed in a landfill if the following requirements are met:
>
> (a) Hazardous waste must be packed in non-leaking inside containers. The inside containers must be of a design and constructed of a material that will not react dangerously with, be decomposed by, or be ignited by the contained waste. Inside containers must be tightly and securely sealed. The inside containers must be of the size and type specified in the Department of Transportation (DOT) hazardous materials regulations (49 CFR Parts 173, 178, and 179), if those regulations specify a particular inside container for the waste.

(b) The inside containers must be overpacked in an open head DOT-specification metal shipping container (49 CFR Parts 178 and 179) of no more than 416 liter (110 gallon) capacity and surrounded by, at a minimum, a sufficient quantity of absorbent material to completely absorb all of the liquid contents of the inside containers. The metal outer container must be full after packing with inside containers and absorbent material.

(c) The absorbent material used must not be capable of reacting dangerously with, being decomposed by, or being ignited by the contents of the inside containers in accordance with §264.17(b).

(d) Incompatible wastes, as defined in §260.10 of this chapter, must not be placed in the same outside container.

(e) Reactive wastes, other than cyanide- or sulfide-bearing waste as defined in §261.23(a)(5) of this chapter, must be treated or rendered non-reactive prior to packaging in accordance with paragraphs (a) through (d) of this section. Cyanide- and sulfide-bearing reactive waste may be packed in accordance with paragraphs (a) through (d) of this section without first being treated or rendered non-reactive.

8.9.2 Guidance to Achieve the Part 264 Standard

Section 264.316 provides that small containers of hazardous wastes in overpacked drums, commonly known as "lab packs", may be placed in landfills if the requirements are met. This provision allows disposal of certain types of reactive wastes, and liquid wastes in drums in accordance with these special conditions.

Permittees are not required to open and inspect all lab packs if they can demonstrate that such practices assume reasonable compliance. For example, where the landfill receives lab packs and has evidence of compliance with the above regulations, a representative sample of the containers may be opened and inspected. Similarly, when the waste generator certifies that the wastes delivering to the landfill comply with the standard, the landfill permittee may satisfy the responsibilities by obtaining the generator's certification and verifying the generator's performance on a representative number of the containers received.

8.9.3 Guidance to Address the Application Information Requirement

The applicant should submit a plan to verify compliance with the regulations regarding disposal of lab packs including:

- review of waste generator's certifications of compliance
- methods to be used to verify compliance.

A suggested attachment to the permit application is Management Plan for Overpacked Drums (Lab Packs).

8.10 REFERENCES

1. U.S. Environmental Protection Agency. Permit Applicants' Guidance Manual for General Facility Standards. Washington, D.C., 1984. (Being drafted)

2. U.S. Environmental Protection Agency. Test Methods for the Evaulation of Solid Waste. SW-846, Washington, D.C., 1982. GPO Stock No. 055-002-81001-2.

3. U.S. Environmental Protection Agency. Lining of Waste Impoundments and Disposal Facilities. SW-870, Washington, D.C., 1983. GPO Stock No. 055-000-000231-2.

4. U.S. Environmental Protection Agency. Draft RCRA Guidance Document: Landfill Design, Liner Systems and Final Cover. Washington, D.C., 1980.

5. U.S. Environmental Protection Agency. Landfill and Surface Impoundment Performance Evaluation. SW-869, Washington, D.C., 1980. GPO Stock No. 055-000-00233-9.

6. U.S. Soil Conservation Seravice National Engineering Handbook 4: Hydrology. Washington, D.C., 1977. NTIS PB244-463.

7. U.S. Weather Bureau. Precipitation Frequency Atlas of the United States. Technical Paper 40, Washington, D.C., 1961.

8. U.S. Soil Conservation Service National Engineering Handbook 5: Hydraulics. Washington, D.C., 1977. NTIS No. PB24-644.

9. U.S. Environmental Protection Agency. Closure of Hazardous Waste Surface Impoundment. SW-873, Washington, D.C., 1982. GPO Stock No. 055-000-00227-4.

10. Armbrust, D.W., and J.D. Dickerson. Temporary Wind Erosion Control: Cost and Effectiveness of 34 Commercial Materials. J. Soil Water Conserv., 26: 154-157, 1981.

11. Lutton, R.J., G.L. Regan, and L.W. Jones. Design and Construction of Covers for Solid Waste Landfils. EPA-600/2-79-165, Army Engineers Experiment Station, Vicksburg, Mississippi, August 1979. NTIS No. PB80-100381.

12. U.S. Environmental Protection Agency. Evaluation Cover Systems for Solid and Hazardous Waste. SW-867, Washington, D.C., 1982. GPO Stock No. 055-000-00228-2.

13. U.S. Environmental Protection Agency. User Guide for the Hydrologic Evaluation of Landfill Performance (HELP) Model. Washington, D.C. (to be released in 1984).

14. Hatayama, H.K., J.J. Chen, E.R. deVera, R.D. Stephens, and D.L. Storm. A Method for Determining the Compatibility of Hazardous Wastes. EPA 600/2-80-076, California Department of Health Services, Berkeley, April 1980. NTIS No. PB80-221005.

15. Hatayama, H.K., R.D. Stephens, E.R. deVera;, J.J. Chen, and D.C. Storm. Hazardous Waste Compatibility. In: Disposal of Hazardous Waste; Proceedings of the 6th Annual Researach Symposium, Chicago, March 1980. Environmental Research Laboratory, Cincinnati, March 1980. NTIS No. PB80-175086. pp. 21-30.

16. U. S. Environmental Protection Agency. Guide to the Disposal of Chemically Stabilized and Solidified Waste. SW-872, Washington, D.C., 1982. GPO Stock No. 055-000-0022-6.

17. U.S. Environmental Protection Agency. Draft Solid Waste Leaching Procedure Manual. Washington, D.C., 1983.

8.11 CHECKLIST

Table 8-1 is a checklist of permit application requirements for landfills. The applicant is encouraged to use the checklist and to incorporate it into the permit application. The checklist identifies the application requirements and provides references to Parts 264 and 270. The applicant should identify the location in the application of the material addressing each requirement. Space is provided for this. This will help insure that the application is complete. As noted in Section 4.0, it is suggested that a copy of this checklist be included as part of the permit application. It will aid the reviewers of the application. Reviewers will be able to more readily locate specific aspects of the application and communications between reviewers and applicants will be facilitated.

Definitions of terms used in the checklist are provided below. Footnotes included in the checklist are explained on the last page of the checklist.

Existing:	A landfill that was in operation or for which construction had commenced on or before issuance of Part B permit and which has or will receive hazardous wastes after January 26, 1983.
New, Type 1:	Single synthetic liner, leachate collection system. Ground-water monitoring (g-w).
New, Type 2:	Double synthetic liner, leachate collection system leak detection, and above ground water. No ground water monitoring.
New, Type 3:	Exempt from liner requirement. Ground-water monitoring may not be required.

An "X" in the checklist indicates that the applicant for that type of unit must address the specific item or an equivalent optional item (if available) in the permit application.

An "O" in the checklist indicates that the item is optional in the permit application. Response to an optional item may eliminate the necessity of responding to certain items that might otherwise be required.

An "e" in the checklist indicates that the item does not apply to "existing portions" of existing units, but does apply to new portions of existing units.

A blank space in the checklist means that either the subject requirement is general, with specific requirements listed below it - the general subject requirement serves as a heading for subordinates, or that the subject requirement does not apply to that type of management unit.

TABLE 8-1

PERMIT APPLICATION CHECKLIST FOR LANDFILLS

Page 1

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
270.14(b)		Part B General Information Requirements						
270.14(b)(1)		- General description of the facility	X	X	X	X		
270.14(b)(2)	264.13(a)	- Chemical and physical analysis of hazardous wastes to be handled	X	X	X	X		
270.14(b)(3)		- Waste analysis plan						
	264.13(b)(1) through (5)	- Analysis parameters with rationale	X	X	X	X		
		- Test methods for analyzing parameters	X	X	X	X		
		- Procedure for collecting representative samples	X	X	X	X		
		- Frequency of analyses	X	X	X	X		
		- List and description of waste analyses to be generator supplied	X	X	X	X		
	264.13(b)(6) and 264.17(c)	- Waste analysis procedures for ignitable, reactive, incompatible wastes	X	X	X	X		
	264.13(c)	- For off-site facilities, procedures to identify each waste movement, and	X	X	X	X		
		- Procedures for collecting representative samples	X	X	X	X		
270.14(b)(4)		- Security description for active portion of facility						
	264.14(a)	- Security procedures waiver justification	0	0	0	0		

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LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Unknowing/unauthorized contact with waste not harmful	0	0	0	0		
		- Unknowing/unauthorized disturbance of waste or equipment cannot cause violation of Part 264	0	0	0	0		
	264.14(b)	- Description of 24-hour surveillance system, or	x	x	x	x		
		- Description of artificial or natural barriers, and	x	x	x	x		
		- Description of controlled entry/egress procedures, and	x	x	x	x		
	264.14(c)	- Description of warning signs	x	x	x	x		
		- List of languages on signs	x	x	x	x		
		- Statement of 25-foot legibility	x	x	x	x		
		- Description of sign locations and numbers of signs	x	x	x	x		
270.14(b)(5)		- General Inspection Schedule and Procedures Description	x	x	x	x		
	264.15(b)(1)	- Written schedule	x	x	x	x		
	264 15(b)(2) and 265 15(d)	- Statement as to where, at facility, inspection schedule and inspection records will be kept	x	x	x	x		
	264 15(b)(1)	- Identification of equipment/processes to be inspected	x	x	x	x		

TABLE 8-1

PERMIT APPLICATION CHECKLIST FOR LANDFILLS

Page 1

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
270.14(b)		Part B General Information Requirements						
270.14(b)(1)		- General description of the facility	X	X	X	X		
270.14(b)(2)	264.13(a)	- Chemical and physical analysis of hazardous wastes to be handled	X	X	X	X		
270.14(b)(3)		- Waste analysis plan						
	264.13(b)(1) through (5)	- Analysis parameters with rationale	X	X	X	X		
		- Test methods for analyzing parameters	X	X	X	X		
		- Procedure for collecting representative samples	X	X	X	X		
		- Frequency of analyses	X	X	X	X		
		- List and description of waste analyses to be generator supplied	X	X	X	X		
	264.13(b)(6) and 264.17(c)	- Waste analysis procedures for ignitable, reactive, incompatible wastes	X	X	X	X		
	264.13(c)	- For off-site facilities, procedures to identify each waste movement, and	X	X	X	X		
		- Procedures for collecting representative samples	X	X	X	X		
270.14(b)(4)		- Security description for active portion of facility						
	264.14(a)	- Security procedures waiver justification	0	0	0	0		

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LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
	264.32(b)	- Description of external communications/alarm system(s)	X	X	X	X		
	264.34(b)	- Documentation of personnel access to external communications/alarm system(s)	X	X	X	X		
	254.32(c)	- Description of fire control/extinguishing, spill control, and decontamination equipment	X	X	X	X		
	264.32(d)	- Documentation of adequate water volume and pressure for above equipment	X	X	X	X		
	264.33	- Documentation of equipment testing/maintenance schedule and procedures	X	X	X	X		
	264.35	- Documentation of adequate aisle space	X	X	X	X		
	264.37 (also 264.52(c))	- Documentation and descriptions of arrangements or attempts at arrangements with:						
		- Police department(s)	X	X	X	X		
		- Fire department(s)	X	X	X	X		
		- Hospitals	X	X	X	X		
		- Local emergency response teams	X	X	X	X		
		- State emergency response teams	X	X	X	X		
		- Emergency response contractors	X	X	X	X		
		- Equipment suppliers	X	X	X	X		

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LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
	264.15(b)(3)	- Identification of types of problems each equipment/process to be checked for	x	x	x	x		
	264.15(b)(4)	- Frequency of inspections by equipment/process	x	x	x	x		
	264.15(c)	- Schedule of remedial action	x	x	x	x		
270.14(b)(5) and 270.21(d)	264.15(a) and 264.303	- Specific Inspection Requirements for Landfills, description of procedures for						
		- Inspection of liners/covers during and immediately after installation	e	x	x			
		- Inspection weekly and after storms for	x	x	x	x		
		- Operation of run-on/run-off controls	x	x	x	x		
		- Liquids in leak detection system			x			
		- Proper functioning of wind dispersal controls	x	x	x	x		
		- Leachate in and proper operation of leachate collection/removal system	e	x	x			
270.14(b)(6)	Part 264 Subpart C	- Preparedness and Prevention Documentation						
		- Waiver(s) request and justification	0	0	0	0		
	264.32(a)	- Description of internal communications/alarm system(s)	x	x	x	x		
	264.34(a)	- Documentation of personnel access to internal communication/alarm system(s)	x	x	x	x		

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LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Description of signal(s) to implement	X	X	X	X		
		- Description of primary and alternate routes	X	X	X	X		
	264.53	- Contingency Plan Copy Location						
		- Description of location of facility's copy of plan	X	X	X	X		
		- Number of duplicate copies distributed and their location	X	X	X	X		
	264.54	- Contingency Plan Amendment						
		- Identification of person responsible and authorized to change/amend plan	X	X	X	X		
		- Description of procedure to change/amend facility copy of plan	X	X	X	X		
		- Description of procedure to insure update of all copies of plan	X	X	X	X		
	264.56	- Detailed Emergency Procedures						
		- Procedure for facility personnel notification	X	X	X	X		
		- Procedure for state/local agency notification	X	X	X	X		
		- Procedure for identification of character, source, amount, and areal extent of released materials	X	X	X	X		

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LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
	264.37(a)(2)	- Documentation of agreements designating primary emergency authority	X	X	X	X		
270.14(b)(7)	Part 264 Subpart D	- Contingency Plan Documentation						
	264.51 and 264.52(a)	- Criteria for implementation of contingency plan	X	X	X	X		
	264.52(d)	- Emergency Coordinators Identification						
		- Names	X	X	X	X		
		- Addresses	X	X	X	X		
		- Home/Work Phones	X	X	X	X		
	264.55	- Documentation of Qualifications	X	X	X	X		
		- Documentation of Authority	X	X	X	X		
		- Description of notification procedure	X	X	X	X		
	264.52(e)	- Emergency equipment list						
		- Documentation of equipment location	X	X	X	X		
		- Physical description of equipment	X	X	X	X		
		- Statement of equipment capabilities	X	X	X	X		
	264 52(f)	- Evacuation Plan						
		- Criteria for implementation	X	X	X	X		

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LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
270.14(b)(8)		- Preventive Procedures, Structures, and Equipment Documentation, including description of equipment/procedures to						
		- Prevent hazards during unloading operations	X	X	X	X		
		- Prevent water supply contamination	X	X	X	X		
		- Mitigate equipment failure and power outages	X	X	X	X		
		- Prevent undue personnel exposure to wastes	X	X	X	X		
270.14(b)(9)	264.17	- Prevention of Accidental Ignition or Reaction Documentation						
		- Description of separation and protection of ignitable, reactive, incompatible wastes	X	X	X	X		
		- Description of ignitable, reactive, incompatible wastes handling procedures	X	X	X	X		
		- Description of number, location, and type of warning/prohibition signs	X	X	X	X		
		- Documentation that procedures are adequate to prevent accidental ignitions or reactions	X	X	X	X		
270.14(b)(9) and 270.21(f) and 270.21(g)	264.17(b)	- Specific Ignitable/Reactive Waste Requirements for Landfills if I/R wastes disposed.						
	264.312	- Procedures that render wastes nonreactive and nonignitable, or	X	X	X	X		
		- Procedures for preventing reactions, and	O	O	O	O		

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LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Procedure for assessment of environment/ human health hazards	X	X	X	X		
		- Identification of On-Scene Coordinator for geographic area	X	X	X	X		
		- Description of specific responses and control procedures for						
		- Fire	X	X	X	X		
		- Explosion	X	X	X	X		
		- Spill	X	X	X	X		
		- Description of process shutdown and monitoring procedures	X	X	X	X		
		- Description of cleanup procedures and associated material treating, storing, disposal procedures	X	X	X	X		
		- Description of emergency equipment cleaning and refitting procedures	X	X	X	X		
		- Description of procedures to insure incompatible waste segregation during cleanup	X	X	X	X		

[Note: There are no §270 requirements which parallel Part 264, Subpart E. However, the applicant should be familiar with the following sections of the regulations since the requirements in them will be enforceable under any permit received.
Part 264, Subpart E, §264.70 through §264.77
Part 270.30, Subpart C
The applicant should be prepared to respond to inquiries by the permit application reviewers regarding these requirements.]

LANDFILLS (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
	264.18(a)	- If Holocene-time faults are within 3,000 feet, demonstration that no faults pass within 200 feet of unit sites (western states)	X	X	X	X		
270.14(b)(ii), (iii) through (v)	264.18(b)	- Documentation of facility location relative to 100-year flood plain level or wave action flooding	X	X	X	X		
		- If unit in flood plain, documentation that facility can withstand the 100-year flood without washout by:	X	X	X	X		
		- Analysis of hydrodynamic/hydrostatic forces resulting at site from 100-year flood, and	X	X	X	X		
		- Presentation of operating units and flood protection devices design and how they will prevent washout, or	X	X	X	X		
		- Plan for removal of waste before washout including,	0	0	0	0		
		- Timing of removal relative to flood levels	0	0	0	0		
		- Estimated time to remove all waste	0	0	0	0		
		- Location to which waste will be moved and proof of compliance with Parts 270 and 264 through 267 of this Chapter	0	0	0	0		
		- Detailed description of personnel, equipment, and procedures for waste removal sufficient to insure availability in time for use	0	0	0	0		

LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Procedures for protecting wastes	0	0	0	0		
	264.313	- Procedures for insuring that incompatible wastes will not be disposed of in same landfill cell	X	X	X	X		
	264.316(c) through (e)	- Procedures for identifying contents and insuring proper landfilling of incoming labpacks	X	X	X	X		
270.14(b)(10)		- Traffic Documentation, identification of:						
		- Waste movement routes	X	X	X	X		
		- Number of movements by type vehicle	X	X	X	X		
		- Quantity of waste moved per movement per vehicle	X	X	X	X		
		- Traffic control signals and personnel	X	X	X	X		
		- Route surface composition and load bearing capacity	X	X	X	X		
270.14(b)(11)		- Facility Location Documentation						
270.14(b)(11)(i) and (ii)		- Political jurisdiction identified (new facilities only)		X	X	X		
		- Comparison to Appendix VI of Part 264	X	X	X	X		
		- Demonstration that faults with displacement in Holocene time are more than 3,000 feet from facility (western states)	X	X	X	X		

LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Estimate of maximum waste inventory in storage/treatment during facility life	X	X	X	X		
	264.114	- Equipment decontamination procedure	X	X	X	X		
		- Estimated year of closure	X	X	X	X		
	254.113	- Description of closure schedule including	X	X	X	X		
		- Total time to close	X	X	X	X		
270.14(b)(13)	254.113	- Trackable intervening closure activities	X	X	X	X		
		- Location(s) and number of copies of closure plan	X	X	X	X		
		- Identification of person responsible for storage and updating of facility copy of closure plan	X	X	X	X		
		- Procedure for updating all other copies of closure plan	X	X	X	X		
270.14(b)(13) and 270.21(e)	264.112 and 264.310(a)	- Specific Closure Plan Requirements for Landfills						
		- Detailed plans and an engineering report which describes the final cover components in detail	X	X	X	X		
		- Documentation that the final cover will	X	X	X	X		
		- Provide long-term minimization of migration of liquids through closed landfill	X	X	X	X		

LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Analysis of potential for discharge during waste movement	0	0	0	0		
		- A plan documenting how and on what time schedule the facility will comply with §264.18(b) if not in compliance (existing facilities only)	X					
270.14(b)(12)	264.16	- Personnel Training Program Documentation						
		- Outline of introductory and continuing personnel training programs	X	X	X	X		
		- Identification and qualifications of program instructor	X	X	X	X		
		- Brief description of how training program meets actual job tasks	X	X	X	X		
		- Description of procedures to insure all appropriate personnel receive appropriate training and receive annual training review	X	X	X	X		
		- Description of records to be kept, their location, and procedures to insure they are retained for proper length of time	X	X	X	X		
270.14(b)(13)	264.112	- Closure Plan Documentation						
		- Description of partial and final closure procedures	X	X	X	X		
		- Description of maximum unclosed portion during facility life	X	X	X	X		

LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Procedure for updating all other copies of post-closure period	X	X	X	X		
270.14(b)(13) and 270.21(e)	264.118 and 264.310(b)	- Specific Post-Closure Plan Requirements for Landfills						
		- Procedures for maintenance and repair of final cover	X	X	X	X		
		- Monitoring and maintenance procedures for leak detection system			X			
		- Procedure for leachate collection/removal system operation	e	X	X			
		- Procedures to maintain and monitor ground water monitoring system	X	X				
		- Procedures for preventing final cap erosion due to run-on and run-off	X	X	X	X		
		- Procedures for protection and maintenance of benchmarks	X	X	X	X		
	264.310(c)	- Procedures to be undertaken if liquid is found in leak detection system			X			
270.14(b)(14)	264.120	- Documentation of Notice on Deed (existing facilities only)	X					
		- Statement that land used to manage wastes	X					
		- Statement of restricted use per §284.117(c)	X					
270.14(b)(15)	264.142	- Closure Cost Estimate	X	X	X	X		

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LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Function with minimum maintenance	X	X	X	X		
		- Promote drainage and minimize erosion/abrasion	X	X	X	X		
		- Settle/subside without losing integrity	X	X	X	X		
		- Be less permeable than bottom liners or subsoils	X	X	X	X		
270.14(b)(13)	264.117 and 264.118	- Post-Closure Plan Documentation						
		- Description of ground-water monitoring[2] activities and frequencies	X	X				
		- Description of maintenance activities and frequencies for:	X	X	X	X		
		- Final containment structures	X	X	X	X		
		- Facility monitoring equipment	X	X	X	X		
		- Location(s) and number of copies of post-closure plan	X	X	X	X		
		- Identification and location (address and phone number) of person responsible for storage and updating of facility copy of post-closure plan prior to closure	X	X	X	X		
		- Identification and location (address and phone number) of person responsible for storage and updating facility copy of post-closure plan during post-closure period	X	X	X	X		

LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
	264.151(e)	- Post-closure insurance	0	0	0	0		
	264.151(f) and (h)	- Financial test and corporate guarantee	0	0	0	0		
		- Multiple financial mechanism for one facility	0	0	0	0		
		- Single financial mechanism for multiple facilities	0	0	0	0		
270.14(b)(17)	264.147	- Documentation of Insurance	X	X	X	X		
		- Request for variance from insurance	0	0	0	0		
	264.151(i) and (j)	- Insurance for sudden/accidental occurrences	X	X	X	X		
		- Insurance for nonsudden/accidental occurrences	X	X	X	X		
	264.151(g)	- Financial test for liability coverage	0	0	0	0		
270.14(b)(18)	264.149	- Documentation of a State Required Financial[1] Mechanism for Closure, Post-Closure, or Liability including	0	0	0	0		
		- EPA I.D. number	0	0	0	0		
		- Facility name	0	0	0	0		
		- Facility address	0	0	0	0		
		- Amounts of liability coverage or funds assured	0	0	0	0		
	264.150	- Documentation of State Assumed Responsibility[1] for Closure Post-Closure or Liability including	0	0	0	0		

LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
	264.143 and 264.146	- Documentation of a financial assurance mechanism for closure that is one of the following:	X	X	X	X		
	264.151(a)	- Closure trust fund	0	0	0	0		
	264.151(b)	- Surety bond guaranteeing payment	0	0	0	0		
	264.151(c)	- Surety bond guaranteeing performance	0	0	0	0		
	264.151(d)	- Closure letter of credit	0	0	0	0		
	264.151(e)	- Closure insurance	0	0	0	0		
	264.15(f) and (h)	- Financial test and corporate guarantee	0	0	0	0		
		- Multiple financial mechanism for one facility	0	0	0	0		
		- Single financial mechanism for multiple facilities	0	0	0	0		
270.14(b)(16)	264.144	- Post-Closure Cost Estimate	X	X	X	X		
	264.145 and 264.146	- Documentation of a financial assurance mechanism for post-closure that is one of the following:	X	X	X	X		
	264.151(a)	- Closure trust fund	0	0	0	0		
	264.151(b)	- Surety bond guaranteeing payment	0	0	0	0		
	264.151(c)	- Surety bond guaranteeing performance	0	0	0	0		
	264.151(d)	- Post-closure letter of credit	0	0	0	0		

LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Injection and withdrawal wells onsite and offsite	X	X	X	X		
		- Buildings and recreation areas *	X	X	X	X		
		- Run-off control systems	X	X	X	X		
		- Access and internal roads	X	X	X	X		
		- Storm, sanitary, and process sewerage systems	X	X	X	X		
		- Loading and unloading areas	X	X	X	X		
		- Fire control facilities	X	X	X	X		
		- Barriers for drainage or flood control	X	X	X	X		
		- Location of past or present operational units and equipment cleanup areas	X	X	X	X		
270.17, 270.18, 270.20 and 270.21		Part B Specific Information Requirements						
270.21		- Specific Requirements for Landfills						
270.21(a)		- List of hazardous wastes to be placed in each landfill cell	X	X	X	X		
270.21(b)	264.301(a)	- Detailed plans and an engineering report describing						
270.21(b)(1)	264.301(a)(1)	- Liner system construction (new only)	e	X	X			
		- Material of construction	e	X	X			

LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Letter from State describing State's responsibilities	O	O	O	O		
		- Facility EPA I.D. number	O	O	O	O		
		- Facility name	O	O	O	O		
		- Facility address	O	O	O	O		
		- Amounts of liability coverage or funds assured	O	O	O	O		
270.14(b)(19)		- Topographic map showing a distance of 1,000 feet around facility at a scale of not more than 1 inch equals 200 feet that clearly shows	X	X	X	X		
		- Contours	X	X	X	X		
		- Proper contour intervals	X	X	X	X		
		- Map scale and date	X	X	X	X		
		- 100-year flood plain area	X	X	X	X		
		- Surface waters and intermittent streams	X	X	X	X		
		- Surrounding land uses	X	X	X	X		
270 14(b)(19)		- Wind rose	X	X	X	X		
		- North orientation	X	X	X	X		
		- Legal boundaries of facility site	X	X	X	X		
		- Access control	X	X	X	X		

LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
	264.301(b)	- Liner system/leachate system exemption including				X		
		- Nature and quantity of wastes				X		
		- Alternative design and operation				X		
		- Landfill location description				X		
		- Hydrogeologic setting				X		
		- Attenuative capacity of materials between landfill and ground and surface waters				X		
270.21(b)(2)	264.301(c)	- System for control of run-on from peak discharge of a 25-year storm	X	X	X	X		
270.21(b)(3)	264.301(d)	- System for control of run-off water volume from a 24-hour, 25-year storm	X	X	X	X		
270.21(b)(4)	264.301(e)	- Procedures to manage collection and holding facilities associated with run-on and run-off control systems	X	X	X	X		
270.21(b)(5)	264.301(f)	- Wind dispersal control procedures	X	X	X	X		
270.21(c)	264.302(a)	- Documentation for Part 264, Subpart F exemption including			X			
		- Landfill and liners above seasonal high water table			X			
		- Two liners meeting requirements of §264.301(a)(1)			X			

LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Chemical properties	e	X	X			
		- Physical strength	e	X	X			
		- Thickness	e	X	X			
		- Foundation design/integrity	e	X	X			
		- Area covered	e	X	X			
		- Liner system integrity against (new only)	e	X	X			
		- Internal and external pressure gradients	e	X	X			
		- Contact with waste/leachate	e	X	X			
		- Climatic conditions	e	X	X			
		- Installation stresses	e	X	X			
		- Daily operational stresses	e	X	X			
	264.301(a)(2)	- Leachate collection and removal system to maintain less than one foot of leachate on liner including	e	X	X			
		- Materials of construction	e	X	X			
		- Chemical resistance to waste/leachate	e	X	X			
		- Sufficient strength to prevent collapse	e	X	X			
270.21(b)		- Provisions to prevent clogging	e	X	X			

LANDFILLS (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Location of aquifers	X	X		X		
270.14(c)(4)(i) through (ii)		- Descriptions of existing contamination	X					
		- Delineation of plume extent	X					
		- Appendix VIII constituents concentrations	X					
		- Concentrations throughout plume	X					
		- Maximum concentration in plume	X					
270.14(c)(5)	264.97	- Detailed plans and an engineering report of Ground-Water Monitoring Program	X	X		X		
	264.97(a)	- Description of wells	X	X		X		
		- Number of wells	X	X		X		
		- Locations	X	X		X		
		- Depths	X	X		X		
		- Assurance of unaffected background water measurement	X	X		X		
		- Assurance of compliance point ground-water measurement	X	X		X		
	264.97(c)	- Casing description	X	X		X		
	264 97(d)	- Description of sampling/analysis procedures	X	X		X		
		- Sample collection methods	X	X		X		

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LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Leak detection system between liners			X			
		- Leachate system meeting §264.301(a)(2) requirements			X			
270.21(h)	264.314	- Documentation of procedures/equipment for landfilling liquid wastes	X	X	X	X		
270.21(i)	264.315	- Documentation of procedures/equipment for landfilling containers	X	X	X	X		
270.14(c)	Part 264 Subpart F	Part B Protection of Ground-Water Information^2 Requirements for Surface Impoundments, Waste Piles, Land Treatment Units, and Landfills						
270.14(c)(1)		- Interim status period ground-water monitoring data summary	X					
270.14(c)(2)		- Identification of uppermost and hydraulically interconnected aquifers under facility including	X	X		X		
		- Water flow rate and direction	X	X		X		
		- Bases for identification	X	X		X		
270.14(c)(3) and 270.14(b)(19)		- Topographic map	X	X		X		
		- Delineation of property boundary	X	X		X		
	264.95(b)	- Delineation of waste management area	X	X		X		
	264.95(a)	- Delineation of proposed point of compliance	X	X		X		
		- Ground-water monitoring well locations	X	X		X		

LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
	264.97(g)(3)	- Quarterly sampling of other wells for one year, and	O	O		O		
	264.97(g)(4)	- Data from a minimum of one sample/well and minimum of four samples per quarter, or	O	O		O		
		- Presentation of procedures to calculate such values	O	O		O		
270.14(c)(6)(ii)	264.98(b)	- Description of an appropriate ground-water monitoring system to be installed at the compliance point	X	X		X		
270.14(c)(6)(iv)	264.98(d)	- Procedures for collecting semi-annual ground-water samples at the compliance point during	X	X		X		
		- Active life	X	X		X		
		- Closure period	X	X		X		
		- Post-closure period	X	X		X		
	264.98(e)	- Procedure for annual determination of uppermost aquifer flow rate and direction	X	X		X		
	264.98(f) and 264.97(d) and (e)	- Documentation of sample collection and analysis procedures	X	X		X		
	264.98(g)	- Procedure for determining a statistically significant increase for any monitored parameter or constituent by	X	X		X		

LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Sample preservation/shipment	X	X		X		
		- Analytical procedures	X	X		X		
		- Chain of custody control	X	X		X		
	264.97(e)	- Documentation of proper/adequate analytical procedures	X	X		X		
	264.97(f)	- Procedure for determination of ground-water elevation with each sample	X	X		X		
270.14(c)(6)	264.91(a)(4) and 264.98	- Description of Detection Monitoring Program[3] including						
270.14(c)(6)(i)	264.93 and 264.98(a)	- List of indicator parameters, waste constituents, reaction products to be monitored for, including	X	X		X		
		- Type, quantities, concentrations expected in wastes	X	X		X		
		- Mobility, stability, persistence in unsaturated zone	X	X		X		
		- Detectability in ground-water	X	X		X		
270.14(c)(6)(ii) and (iii)	264.98(a)(4) and 26498(c)(1)	- Background ground-water concentration values and coefficients of variation established by one of the following[4]:	X	X	X	X		
	264.98(c)(3)	- Use of an appropriate ground-water monitoring system, and	0	0		0		
	264.97(g)(1)	- Quarterly sampling of upgradient wells for one year, or	0	0		0		

LANDFILLS (Continued)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Hazardous constituents identified	0			0		
		- Hazardous constituents concentrations	0			0		
	264.99(b)	- Description of compliance monitoring system at the compliance point	0	0		0		
		- List of hazardous constituents to be compliance monitored	0	0		0		
	264.96	- Proposed compliance period^6	0					
	264.99(d)	- Procedure for collecting quarterly samples at compliance point during compliance period	0	0		0		
	264.99(c)(3)	- Procedures for establishing background concentration values for constituents that are based on one of the following:	0	0		0		
		- Use of an appropriate ground-water monitoring system, and	0	0		0		
	264.97(g)	- Data that is available prior to permit issuance	0	0		0		
		- Data that accounts for measurement errors in sampling and analysis	0	0		0		
		- Data that accounts for seasonal ground-water quality fluctuations	0	0		0		
		- Data from a minimum of one sample per well and a minimum of four samples from monitoring system, each time system is sampled	0	0		0		

LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
		- Comparing compliance point data to background value data using the procedures in §264.97(h)(1) or (2), and	X	X		X		
		- Providing an estimate of the time period after sampling completion necessary to obtain results	X	X		X		
	264.98(h)	- Procedure to be implemented if a statistically significant increase in any constituent or parameter is identified at any compliance point monitoring well, including	X	X		X		
	264.98(h)(1)	- Written notification to Regional Administrator	X	X		X		
	264.98(h)(2)	- Sample collection and analysis methods for all Appendix VIII constituents at all monitoring wells	X	X		X		
	264.98(h)(3)	- Method for establishing Appendix VIII constituent background values	X	X		X		
	264.98(h)(4)	- Preparation of an application for permit modification to establish compliance monitoring	X	X		X		
270.14(c)(7)	264.91(a)(1) and 264.99	- Description of Compliance Monitoring Program[5], including	O	O		O		
		- List of wastes previously handled at facility	O			O		
		- Characterization of contaminated ground-water	O			O		

LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
	264.99(i)(1)	- Written notification to Regional Administrator	0	0		0		
	264.99(i)(2)	- Preparation of an application for permit modification to establish a corrective action program, including ª	0	0		0		
		- Details of program to comply with ground-water protection standard	0	0		0		
270.14(c)(7)(v)	264.99(i)(2)(ii)	- Details of ground-water monitoring to demonstrate effectiveness of program	0	0		0		
270.14(c)(8)	264.91(a)(2) and 264.100	- Description of Corrective Action Program[7] including	0	0		0		
270.14(c)(8)(i)		- Characterization of contaminated ground-water	0					
	264.100(a)(1)	- Identified hazardous constituents	0					
		- Concentrations of hazardous constituents	0					
270.14(c)(8)(ii)	264.100(a)(2)	- Concentration limit for each hazardous constituent	0	0		0		
270.14(c)(8)(iii)	264.100(b)	- Detailed plan and an engineering report describing the corrective actions to be taken at the compliance point	0	0		0		
	264.100(c)	- Time period necessary to implement corrective action program	0	0		0		
270.14(c)(8)(iv)	264.100(d)	- Description of ground-water monitoring program that will be sufficient to assess the adequacy of corrective action	0	0		0		

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LANDFILLS (Continued)

Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comments
270.14(c)(7)(iv)	264.92 and 264.99(c)(1), (2)	- Proposed concentration limits for constituents with justification based on	0	0		0		
		- §264.94(a)(1) and §264.97(g)	0	0		0		
		- §264.94(a)(2)	0	0		0		
		- §264.94(b) and §264.99(c)(1)	0	0		0		
	264.99(e)	- Procedure for annual determination of uppermost aquifer flow rate and direction	0	0		0		
	264.99(f)	- Procedures for annual testing of all compliance point wells for Appendix VIII constituents	0	0		0		
	264.99(g)	- Documentation of all sampling and analysis procedures	0	0		0		
	264.99(h)	- Procedures for determining a statistically significant increase for any monitored constituent by	0	0		0		
		- Comparing compliance point data to the concentration limit using the procedure in §264.97(h)(2)	0	0		0		
		- Providing an estimate of the time period after sampling completion necessary to obtain results	0	0		0		
	264.99(i)	- Procedures to be implemented if the ground-water protection standard is exceeded at any compliance point monitoring well, including	0	0		0		

FOOTNOTES FOR LANDFILLS

[1] State-specific. Contact State or Regional EPA representatives to discuss requirements.

[2] New, Type 3 units are not automatically exempt from ground-water protection standards of Subpart F. Applicants are subject to indicated requirements unless Section 264.90(b)(4) waiver has been granted.

[3] Applies to new facilities and existing facilities at which contamination has not been detected.

[4] Existing facilities must submit interim status ground-water monitoring data including background data for certain parameters. If no data are available, contact appropriate State or Regional EPA personnel.

[5] Required of existing facilities where ground-water monitoring data indicate the presence of hazardous constituents. New or existing units without contamination may have a Compliance Monitoring Program included in the permit on "stand-by" under some circumstances.

[6] Applicable to existing facilities with indications of hazardous constituents in the groundwater.

[7] Applicability to existing facilities will be on a case-by-case basis based on monitoring data indicating groundwater contamination. New Type 1 and Type 3 units and existing units without contamination may have Corrective Action Plans in the permit on "stand-by" under some circumstances.

LANDFILLS (Concluded)

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Part 270	Part 264	Subject Requirement	Existing	New, Type 1, 1 liner, g-w	New, Type 2, 2 liners	New, Type 3, 0 liners	Location in Application	Comment
	264.91(a)(3) and 264.100(e)	- Description of the corrective action to be taken for constituents in ground-water between compliance point and downgradient facility boundary	0	0		0		
	264.100(g)	- Procedure and content for semi-annually submitting written reports to the Regional Administrator on program effectiveness	0	0		0		
		Part B Certification and Signatories						
270.11(d)		- Certification paragraph	X	X	X	X		
270.11(a)		- Appropriate signatory	X	X	X	X		

SECTION 9.0

GROUND-WATER PROTECTION

Section 9.0 is divided into nine subsections as follows:

9.1 Introduction

9.2 Summary of Interim Status Monitoring Data

9.3 Identification of the Uppermost Aquifer and Its Characteristics

9.4 Waste Management Area, Point of Compliance, and Well Locations

9.5 Description of any Ground-Water Contamination

9.6 Detection Monitoring Program

9.7 Compliance Monitoring Program

9.8 Corrective Action Program

9.9 References

9.1 INTRODUCTION

This section provides detailed guidance to applicants on the permit application information requirements of §270.14(c) and the corresponding ground-water protection standards in Part 264, Subpart F.

9.1.1 Applicability

The ground-water protection requirements are applicable to "regulated units", as explained in Section 9.4. There are limited exemptions from the standards. Any of the general exclusions of §264.1 remove certain facilities from ground-water protection as well. Other exemptions include:

- Double-lined surface impoundments, waste piles, and landfills (§264.222, §264.252, and §264.302 respectively).

- Indoor waste piles with no liquids (§264.250(c)).
- Waste piles at which the waste is periodically removed and the liner is inspected (§264.253).

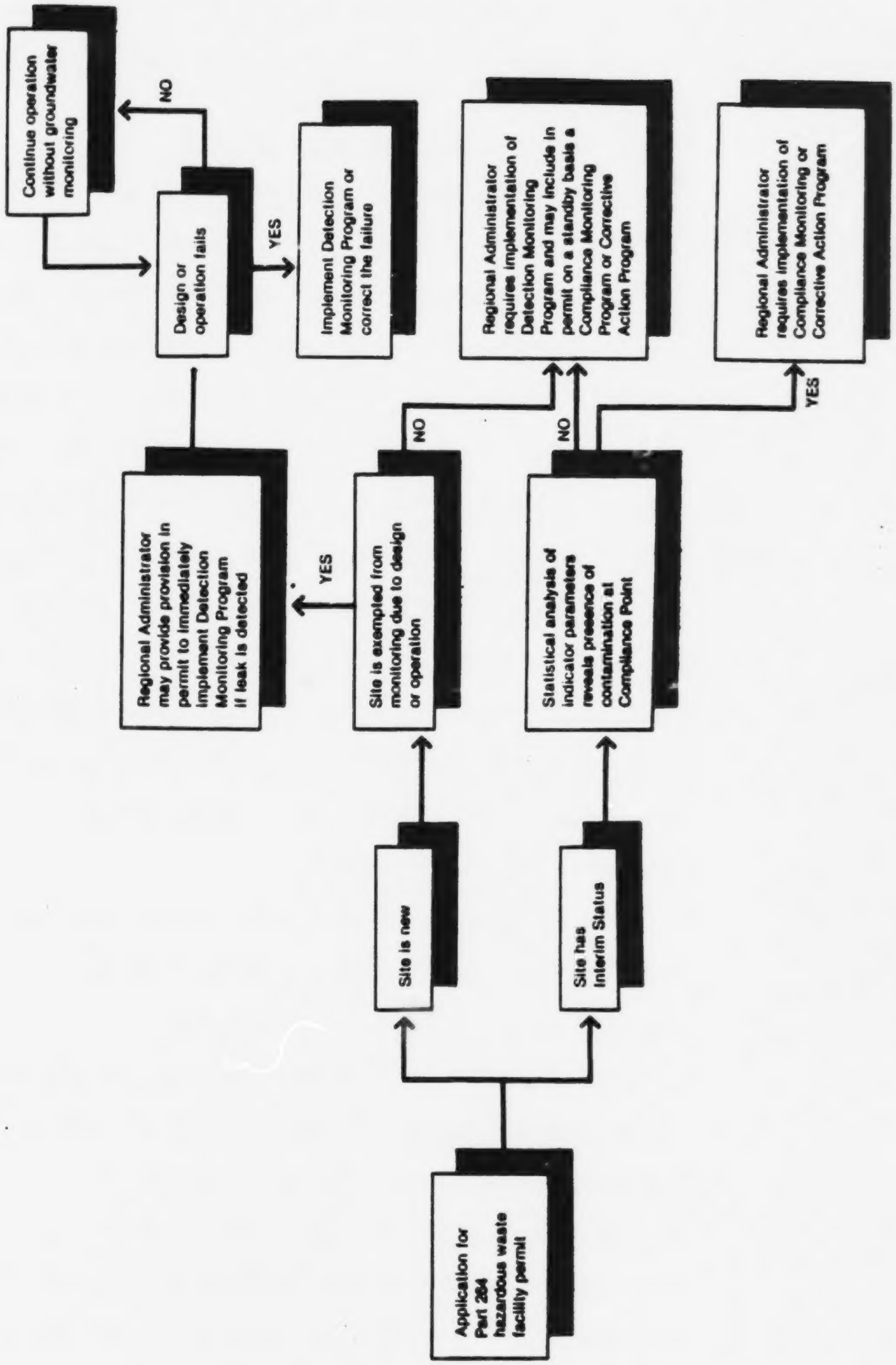
9.1.2 Summary of the Regulations

The ground-water protection requirements establish a three-stage program to detect, evaluate, and, if necessary, correct ground-water contamination during the active life of the unit plus a compliance period designated in the permit. The basic elements of this program are described in Figure 9-1.

Unless there is known contamination, the first stage of the ground-water monitoring and response program is a detection monitoring program, which requires the permittee to install a ground-water monitoring system (including both upgradient and downgradient wells) to monitor the ground water for hazardous constituents. The detection program must be capable of indicating whether a leachate plume has brought hazardous constituents to the point of compliance. This program is described in Section 9.6.

If hazardous constituents are detected in ground water at the point of compliance, a second stage - a compliance monitoring program - is established. The compliance monitoring program measures the concentration of all hazardous constituents in the ground water. The results of compliance monitoring are compared against a Ground-Water Protection Standard established in the permit. Section 9.7 describes this program.

If the Ground-Water Protection Standard is violated, the third stage - corrective action - must be implemented.


Application for Part 264 hazardous waste facility permit
Site is new
Site has Interim Status
Site is exempted from monitoring due to design or operation
YES
NO
Regional Administrator may provide provision in permit to immediately implement Detection Monitoring Program if leak is detected
Design or operation fails
YES
NO
Continue operation without groundwater monitoring
Implement Detection Monitoring Program or correct the failure
Statistical analysis of indicator parameters reveals presence of contamination at Compliance Point
NO
YES
Regional Administrator requires implementation of Detection Monitoring Program and may include in permit on a standby basis a Compliance Monitoring Program or Corrective Action Program
Regional Administrator requires implementation of Compliance Monitoring or Corrective Action Program

Corrective Action). Responses to the first group of requirements above and contact with the Regional Office will determine which program is appropriate for the facility.

9.1.4 Facilities Without Interim Status Monitoring Data

Some facilities with Interim Status may not have ground-water monitoring data. Some facilities may have no data due to the self-granted waiver opportunity under §265.90(c). The owners or operators of such facilities seeking permits under Part 264 should contact the Regional Office at their earliest opportunity. The Regional Office will evaluate the information used in addressing the waiver under §265.90(c). If the Regional Office finds that the waiver was inappropriate, it will direct the applicant to obtain information which satisfies the information requirements, in particular, §270.14(c).

If the waiver was appropriate, and if the applicant also proposes an exemption from Subpart F under §264.90(b)(4), the applicant should fully discuss the necessary demonstrations for this exemption with the Regional Office at the earliest opportunity. This is necessary to ensure efficient processing of the permit application.

When there are no monitoring data because the facility is an Interim Status waste pile not subject to the Interim Status ground-water monitoring requirements, the applicant should meet with the Regional Office at the earliest opportunity. The applicant should collect information in response to the requirements in §270.14(c)(2) through §270.14(c)(4) presented in Sections 9.3 through 9.5.

Corrective action must continue until the Standard is complied with. Corrective action consists of the removal of the contamination (by pumping or other means) or in-situ treatment of the hazardous constituents. Section 9.8 describes this program. Permit modifications are required when there is a need to progress from one stage of the program to the next, unless the permit includes the next stage on a contingent basis.

9.1.3 Permit Application Information Requirements

The permit application information requirements covering the ground-water protection requirements are established in §270.14(c) and are presented in Sections 9.2 through 9.8.

These application information requirements can be divided into two basic groups and establish a convenient system for applicants to assemble information and hold progress discussions with the Regional Office, as outlined below.

The first group consists of §270.14(c)(1) through §270.14 (c)(4). These requirements establish the nature of any impact of the facility on the ground water, as well as the aquifer's characteristics and the extent of the waste management area. It will be useful for applicants to meet with the Regional Office during and, in particular, after the compilation of the information necessary to address these requirements. This contact will assist the applicant in addressing the information appropriate for one of the basic monitoring and response programs

The second group includes the ground-water monitoring and response programs (Detection Monitoring, Compliance Monitoring, or to demonstrate a qualification for an exclusion from Subpart F reponsibilities.

9.2.3 Guidance to Address the Application Information Requirement

This section is divided into guidance for facilities that have Interim Status ground-water monitoring results, and those that do not.

9.2.3.1 Facilities That Have Interim Status Ground-Water Monitoring Data --

For facilities which have ground-water monitoring data, the following information should be submitted. Detailed guidance on how to gather and report these data is given in Ground-Water Monitoring Guidance for Owners and Operators of Interim Status Facilties (SW-963). A suggested attachment to the permit application is Interim Status Ground-Water Monitoring Data.

- A copy of the map provided for in Part 270.14(b)(19), on which the location and identification of each monitoring well are indicated. Indicate which wells are upgradient of the disposal area and which are downgradient.

- A description of the design and construction of each monitoring well (e.g., depths of screen and casing, depths at which water was encountered, filter pack and sealing materials placement, dates of construction, boring logs, etc.).

- A copy of the facility's ground-water sampling and analysis plan that includes the procedures used and the protocol followed in:

  -- sample collection;
  -- sample preservation and shipment;
  -- analytical procedures; and
  -- chain of custody control.

9.2 SUMMARY OF INTERIM STATUS MONITORING DATA

9.2.1 The Federal Requirement

Section 270.14(c)(1) states the Part B application should include:

> A summary of the ground-water monitoring data obtained during the interim status period under §§265.90-265.94, where applicable.

Sections 265.90 through 265.94 are too long to reprint here. The reader should consult the regulations for the complete text. See 45 FR 33240.

9.2.2 Guidance to Achieve the Part 264 Standard

There is no explicit permitting standard in Part 264 which corresponds to the application information requirement. Rather, §270.14(c)(1) requires the applicant to present the data collected during Interim Status monitoring at an existing facility as a means of determining how the facility should be permitted under the Part 264 Subpart F three-stage system. The preamble to Part 264 states (see 47 FR 32294):

> The nature of the program established in the initial permit will depend on the information available at the time of permitting. The key question is whether a regulated unit has begun to leak. For new units this is not an issue, but it may be somewhat problematic for existing units. Since the owners or operators of most existing units will be conducting monitoring in accord with the Part 265 interim status requirements, there should be a reliable base of information that can be used to determine whether hazardous constituents have entered the ground water.

An applicant also may seek to use data from interim status monitoring results to justify an alternate concentration limit for particular hazardous constituents (see 47 FR 32305), EPA Identifier ______________________

RESULTS OF FIRST YEAR'S

GROUND-WATER MONITORING

Figure 9-2

- A description of the statistical procedures used (if applicable) in processing the data (as in the use of a Student t-test and the level of significance used).

- Copies of each quarterly (from first year) water analysis results for each well, and copies of any subsequent (annual or semi-annual) water analysis reports to date. Sample data report forms are provided in Figures 9-2 and 9-3. Include copies of any notifications of significant change in water analysis parameter values made to the Regional Administrator (or State Director) pursuant to §265.93.

- A description of observable trends in the above data, showing the coefficient of variability, seasonality and including a discussion of probable causes for changes.

9.2.3.2 Facilities That Do Not Have Interim Status Data --

New facilities will not have Interim Status ground-water monitoring results. The applicant should proceed to the next application information requirement (§270.14(c)(2)).

Some existing, Interim Status facilities may not have Interim Status ground-water monitoring data due to a waiver under §265.90(c). A permit applicant whose facility fits this category should consult Section 9.1.4 for guidance.

Owners and operators of waste piles with Interim Status are not subject to the Interim Status ground-water monitoring standards. They are not, however, exempt from the ground-water protection standards under Part 264, Subpart F (except under the special cases described in §264.250(c), 264.252, and 264.253). Persons submitting applications for waste piles that have Interim Status, and do not have ground-water monitoring data should consult Section 9.1 for guidance.

Figure 9-2 (con't)

EPA Identifier ________________________

Person to contact about data: ______________________________

Telephone number: ______________________________

Number of wells reported:

Upgradient __________

Downgradient __________

Total __________

Sampling Dates (Month, Year): _______________________

____

____

____

Name and address of laboratory performing analyses:

____

____

____

Instructions and Comments for Recording of Ground-Water Monitoring Data for the First Year

- The forms are self-explanatory.

- This data recording format contains pages for the following information:

  - General Information
  - Indicator Parameters at Upgradient Wells
  - Indicator Parameters at Downgradient Wells
  - Indicator Parameters at Downgradient Wells (Optional Form)
  - Ground-Water Quality Parameters
  - Drinking Water Suitability Parameters
  - EPA Interim Primary Drinking Water Standards

- Put the EPA Identifier on each page.

- If more than four wells are monitored or additional recording forms are required, these forms may be duplicated and used. These should be designated consecutively in small case letters immediately after the page number (e.g., pages 5a, 5b, 5c, etc.).

- Designate upgradient and downgradient wells where specified.

- Samples for the indicator parameters need not be replicated at downgradient wells during the first year.

- Use "<" to designate less than the detection limit and report the detection limit. For example, "<5.0" means the observed value is less than the detection limit of 5.0.

- Indicate with a "*" any values for each of the Drinking Water Suitability Parameters which exceed EPA Interim Primary Drinking Water Standards (which are attached at end of packet)
- Locations and identifications of the wells should be shown on the site map required in §270.14(b)(19).

- Attach any additional information, data or comments to this recording form.

- If you have any questions contact personnel at the EPA Regiona Office.

Figure 9-2 (con't)

Figure 9-2 (con't)

EPA Identifier: ____________________

PARAMETERS USED AS INDICATORS OF GROUND-WATER CONTAMINATION

Downgradient Wells*

PARAMETER (UNIT)	QUARTER	pH (pH UNITS)	SPECIFIC CONDUCTANCE (umhos/cm)	TOC (mg/l)	TOX (ug/l)
Well # __________ Sample Date ______ Water Elev. ______	1				
	2				
	3				
	4				
Well # __________ Sample Date ______ Water Elev. ______	1				
	2				
	3				
	4				
Well # __________ Sample Date ______ Water Elev. ______	1				
	2				
	3				
	4				
Well # __________ Sample Date ______ Water Elev. ______	1				
	2				
	3				
	4				

* Use optional form on next page if downgradient samples were replicated.
NOTE: Downgradient samples do not need to be replicated.

Figure 9-2 (con't)

EPA Identifier ____________________

PARAMETERS USED AS INDICATORS OF GROUND-WATER CONTAMINATION

Upgradient Well

Well # ______

PARAMETER (UNIT)	REPS	pH (pH UNITS)	SPECIFIC CONDUCTANCE (umhos/cm)	TOC (mg/l)	TOX (ug/l)
Quarter 1 Sample Date ______ Water Elev. ______	1				
	2				
	3				
	4				
Quarter 2 Sample Date ______ Water Elev. ______	1				
	2				
	3				
	4				
Quarter 3 Sample Date ______ Water Elev. ______	1				
	2				
	3				
	4				
Quarter 4 Sample Date ______ Water Elev. ______	1				
	2				
	3				
	4				
Background Mean					
Background Variance					

Figure 9-2 (con't)

EPA Identifier ____________________

PARAMETERS ESTABLISHING GROUND-WATER QUALITY

PARAMETER (UNIT)	WELL # ___ Upgradient ___ Downgradient ___				WELL # ___ Upgradient ___ Downgradient ___				COMMENTS
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Chloride (mg/1)									
Iron (mg/1)									
Manganese (mg/1)									
Phenols (ug/1)									
Sodium (mg/1)									
Sulfate (mg/1)									

PARAMETER (UNIT)	WELL # ___ Upgradient ___ Downgradient ___				WELL # ___ Upgradient ___ Downgradient ___				COMMENTS
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Chloride (mg/1)									
Iron (mg/1)									
Manganese (mg/1)									
Phenols (ug/1)									
Sodium (mg/1)									
Sulfate (mg/1)									

Q = Quarter

Figure 9-2 (con't)

EPA Identifier ____________________

DRINKING WATER SUITABILITY PARAMETERS

	Upgradient ____ Downgradient ____ Well # ____				Upgradient ____ Downgradient ____ Well # ____				
PARAMETER (UNIT)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	COMMENTS
Arsenic (mg/l)									
Barium (mg/l)									
Cadmium (mg/l)									
Chromium (mg/l)									
Fluoride (mg/l)									
Lead (mg/l)									
Mercury (mg/l)									
Nitrate, as N (mg/l)									
Selenium (mg/l)									
Silver (mg/l)									
Endrin (ug/l)									
Lindane (ug/l)									
Methoxychlor (ug/l)									
Toxaphene (ug/l)									
2,4-D (ug/l)									
2,4,5-TP Silvex (ug/l)									
Radium (pCi/l)									
Gross Alpha (pCi/l)									
Gross Beta (pCi/l)									
Coliform Bacteria (/100ml)									

*Exceeds EPA interim primary drinking water standards

Figure 9-2 (con't)

EPA Identifier ______________________________

DRINKING WATER SUITABILITY PARAMETERS

	Upgradient _____ Downgradient _____ Well # _____				Upgradient _____ Downgradient _____ Well # _____				
PARAMETER (UNIT)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	COMMENTS
Arsenic (mg/1)									
Barium (mg/1)									
Cadmium (mg/1)									
Chromium (mg/1)									
Fluoride (mg/1)									
Lead (mg/1)									
Mercury (mg/1)									
Nitrate, as N (mg/1)									
Selenium (mg/1)									
Silver (mg/1)									
Endrin (ug/1)									
Lindane (ug/1)									
Methoxychlor (ug/1)									
Toxaphene (ug/1)									
2,4-D (ug/1)									
2,4,5-TP Silvex (ug/1)									
Radium (pCi/1)									
Gross Alpha (pCi/1)									
Gross Beta (pCi/1)									
Coliform Bacteria (/100ml)									

*Exceeds EPA interim primary drinking water standards

Figure 9-2 (con't)

EPA INTERIM PRIMARY DRINKING WATER STANDARDS

PARAMETERS	EPA IPDWS MAX LEVEL (mg/1)
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium, Total	0.05
Fluoride	1.4 - 2.4
Lead	0.05
Mercury	0.002
Nitrate (as N)	10
Selenium	0.01
Silver	0.05
Endrin	0.0002
Lindane	0.004
Methoxychlor	0.1
Toxaphene	0.005
2,4-D	0.1
2,4,5-TP Silvex	0.01
Radium	5pCi/1
Gross Alpha	15pCi/1
Gross Beta	pCi/1
Coliform Bacteria	1/100ml

EPA Identifier ____ ________________

RESULTS OF GROUND-WATER MONITORING
AFTER THE FIRST YEAR

Figure 9-3

Figure 9-3 (con't)

Instructions for Recording of Ground-Water Monitoring Data After the First Year

- The forms are self-explanatory.
- The data reporting form contains pages for the following information:
  - General Information
  - Indicator Parameters
  - Parameters Establishing Ground-Water Quality
- Put the EPA Identifier on each page.
- If more than four wells are monitored, additional data forms can be duplicated and used. These should be designated consecutively in small case letters immediately after the page number (e.g., pages 3a, 3b, 3c, etc.)
- Designate upgradient and downgradient wells.
- Indicator parameters, which need to be replicated (4 replications per sample per parameter) at each well, are to be sampled at least semiannually and the results submitted by March 1 of each year.
- The ground-water quality parameters which need not be replicated are to be sampled at least annually.
- Use "<" to designate less than the detection limit and report the detection limit. For example, "<5.0" means the observed value is less than the detection limit of 5.0.
- Locations and identifications of the wells should be shown on the site map required in §270.14(b)(19).
- Attach any additional information, data or comments to the back of this reporting form.
- If any questions contact personnel at the EPA Regional Office.

Figure 9-3 (con't)

EPA Identifier ____________________

Person to contact about data: ____________________

Telephone number: ____________________

Number of wells reported:

Upgradient ________

Downgradient ________

Total ________

Sampling Dates (Month, Year): ____________________

____

____

____

Name and address of laboratory performing analyses:

____

____

____

Figure 9-3 (con't)

EPA Identifier ____________________

Sample Date: ____________________

PARAMETERS USED AS INDICATORS OF GROUND-WATER CONTAMINATION

PARAMETER (UNIT)	Upgradient ____ Downgradient ____						Upgradient ____ Downgradient ____						COMMENTS
	Well # ____ Water Elev. (ft.) ____						Well # ____ Water Elev. (ft.) ____						
	Rep#1	Rep#2	Rep#3	Rep#4	Mean	Variance	Rep#1	Rep#2	Rep#3	Rep#4	Mean	Variance	
pH (pH units)													
Specific Conductance (umhos/cm)													
TOC (mg/l)													
TOX (ug/l)													

PARAMETERS USED AS INDICATORS OF GROUNDWATER CONTAMINATION

PARAMETER (UNIT)	Upgradient ____ Downgradient ____						Upgradient ____ Downgradient ____						COMMENTS
	Well # ____ Water Elev. (ft.) ____						Well # ____ Water Elev. (ft.) ____						
	Rep#1	Rep#2	Rep#3	Rep#4	Mean	Variance	Rep#1	Rep#2	Rep#3	Rep#4	Mean	Variance	
pH (pH units)													
Specific Conductance (umhos/cm)													
TOC (mg/l)													
TOX (ug/l)													

Sampling Date: ____________________

EPA Identifier ____________________

PARAMETERS ESTABLISHING GROUND-WATER QUALITY

PARAMETER (UNIT)	UPGRADIENT				COMMENTS
	WELL # ____ WATER ELEV. (ft) ___	WELL # ____ WATER ELEV. (ft) ___	WELL # ____ WATER ELEV. (ft) ___	WELL # ____ WATER ELEV. (ft) ___	
Chloride (mg/1)					
Iron (mg/1)					
Manganese (mg/1)					
Phenols (ug/1)					
Sodium (mg/1)					
Sulfate (mg/1)					

PARAMETER (UNIT)	DOWNGRADIENT				COMMENTS
	WELL # ____ WATER ELEV. (ft) ___	WELL # ____ WATER ELEV. (ft) ___	WELL # ____ WATER ELEV. (ft) ___	WELL # ____ WATER ELEV. (ft) ___	
Chloride (mg/1)					
Iron (mg/1)					
Manganese (mg/1)					
Phenols (ug/1)					
Sodium (mg/1)					
Sulfate (mg/1)					

Figure 9-3 (con't)

9.3 IDENTIFICATION OF UPPERMOST AQUIFER AND ITS CHARACTERISTICS

9.3.1 The Federal Requirement

Section 270.14(c)(2) requires:

> Identification of the uppermost aquifer and aquifers hydraulically interconnected beneath the facility property, including ground-water flow direction and the basis for such identification (i.e., the information obtained from hydrogeologic investigations of the facility area).

Definitions from §260.10 include:

> 'Aquifer' means a geologic formation, group of formations or part of a formation capable of yielding a significant amount of ground water to wells or springs.
>
> 'Uppermost aquifer' means the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary.

9.3.2 Guidance to Achieve the Part 264 Standard

The rationale for this requirement is explained in the preamble (47 FR 32305). EPA will be evaluating the adequacy of the proposed ground-water monitoring system during the permitting process. Accurate information about the aquifer(s) beneath the facility is essential for this evaluation. The information presented for this requirement will serve as a basis for locating and constructing monitoring wells. It is also needed for determining the frequency of sampling of these wells. Applicants who propose alternative concentration limits under §264.99 will need to thoroughly explain the hydrogeologic system in their applications. Finally, if corrective action measures are required, a complete and thorough description of the hydrogeologic system and flow rates are essential for designing an effective and efficient corrective action plan.

As noted in the preamble discussion on the definition of aquifer (47 FR 32289), determining what quantity is a "significant amount" is site specific and variable.

The definition of uppermost aquifer (normally the first aquifer affected by facility leakage) includes any lower aquifers that are hydraulically interconnected (see 47 FR 32290). In some locations, aquifers at different levels beneath a facility are linked, thereby enabling any contaminants that enter the topmost water body to infiltrate to a lower aquifer.

9.3.3 Guidance on Addressing the Application Information Requirement

To address this standard, the applicant should provide a specific identification of the uppermost aquifer beneath the facility, and a determination of flow rate and direction in that uppermost aquifer. Additionally, the applicant should provide the information that was used to make the identification and determination. This should be a report written by a qualified hydrogeologist on the hydrogeologic characteristics of the facility property supported by at least the drilling logs of the monitoring wells and the available professional literature.

9.3.3.1 Uppermost aquifer --

The identification of the uppermost aquifer may or may not be straightforward. The most difficult aspect of the identification is determining the degree of hydraulic interconnection of water-bearing units. It can be argued that any sequence of aquifers is interconnected hydraulically to some degree. For most sites, the degree of interconnection will be either high or low depending on the presence of an aquitard.

The American Geological Institute defines "aquitard" as "a confining bed that does not prevent the flow of water to or from an adjacent aquifer" but "does not readily yield water to a well or spring". An aquitard "may serve as a storage unit for ground water". A formation is usually considered an aquitard if its hydraulic conductivity is 10^{-6} cm per sec or less.

The Agency assumes that any of the following is evidence of a high degree of multiple aquifer interconnection:

- The aquitard pinches out within the property boundary,
- The aquitard is significantly fractured or karst,
- Numerous wells that are inadequately sealed penetrate the aquitard within the facility property boundary, or
- Pumping or injection tests show a measurable response in the aquifer on the other side of the aquitard.

Conditions for which a lack of interconnection can usually be assumed are:

- The aquitard is laterally continuous and easily correlatable between borings/wells, the contrast in hydraulic conductivity between the aquifer and the aquitard is at least 100 to 1, and the aquitard is not karst or signs of fracturing are minimal (the aquitard's hydraulic conductivity being no greater than 10-6 cm per sec,
- Measurably different piezometric levels in different water bearing zones above and below aquitard,
- Quantitatively minor leakage from aquitard during pump test or minor intake during inflow (packer) test, or
- Lack of measurable response in lower water bearing unit during pump test within overlying water bearing unit.

For aquitards that do not meet one of the above classifications, the applicant should determine whether contaminated fluids could possibly migrate through the aquitard during the life (i.e., the active period, the closure period, and the post-closure care period) of the facility. This assessment should be based on travel time calculations assuming the conservative factors required for any waiver demonstration under §264.90(b)(4).

9.3.3.2 Aquifer --

An aquifer is defined as "a geologic formation, group of formations, or part of a formation capable of yielding a significant amount of water to wells and springs". Two key words are "capable" and "significant". A hydrogeologic unit can be an aquifer whether or not it is currently being used as a source of water supply, as long as the unit is capable of yielding a significant amount. The word "significant" is relative in this context. In areas underlain by high yield aquifers, low yield units may not be locally considered as aquifers. In other areas, similar low yield units may be used extensively for domestic water supplies. When the applicant is uncertain whether a particular unit should be considered to be an aquifer, he should discuss the matter with the Regional Office after seeking information on the matter from State or local water resource agencies.

The point of measurement of significant amount is not restricted to wells. Ground-water discharge at springs must also be considered. Springs occur as isolated features, or more typically, along the length of surface water bodies such as streams and ponds. These features are, in fact, typical ground-water discharge zones. Consequently, the Agency considers a hydrogeologic unit to be an aquifer for monitoring purposes if the lateral flow of ground water discharges significant amounts of water to a surface water body. Further guidance on identifying aquifers is presented in the Permit Writer's Guidance Manual for Subpart F, Ground-Water Protection (Reference 1).

9.3.3.3 Flow rate and direction --

The ground water flow rate and direction in the uppermost aquifer can be determined from ground-water head data (or pressures in some cases), and hydraulic conductivity data, or by direct, in-situ measurement (e.g., tracer tests). This information must be obtained by hydrogeologic studies conducted at (and in some cases, nearby) the facility. The flow rate and direction have three possible components; two components are horizontal, and one is vertical. Flow rate and direction can vary significantly over the area of a facility and with time.

In order to determine flow rate and direction, the hydrogeologi study should include water level monitoring in wells and piezometers The monitoring of water levels should normally be conducted over several seasons in order to characterize transient changes in flow rates and directions. The amount of water level monitoring and hydrologic testing required at a facility will increase with the complexity and variability of the flow system. Further guidance on the determination of flow rate and direction is provided in the Reference 1.

EPA strongly recommends the use of nested piezometers for determination of the vertical components of the gradient. Such piezometer clusters will provide the hydrogeologist with data to distinguish between recharge and discharge conditions. The information is necessary to properly locate the open interval of monitoring wells.

A requirement of both the detection monitoring and compliance monitoring programs is an annual redetermination of flow rate and direction (see §§264.98(c) and 264.99(e)). EPA believes that it may often be possible for a permittee to compare ground-water level data against the levels present when the original determination was made; if these levels are the same, it is most likely that the flow rate and direction has not changed. EPA is considering an amendment to Subpart F that will clarify this option.

9.3.3.4 Hydrogeologic report --

In addressing the application information requirement, the applicant should include supporting information used to identify the uppermost aquifer and to determine flow rate and direction. Supporting information should be in the form of a report of the hydrogeologic field investigation conducted at the site with field data appended to the report. The report should include a description of the regional geologic and hydrogeologic setting.

The report serves as a basis for addressing many concerns. It provides information needed to implement the monitoring system design standards under §264.97, including water intake interval and well construction, sampling frequency and definition of upgradient and downgradient. Applicants proposing alternate concentration limits under §264.98 will need to show the patterns of ground-water flow and use in the vicinity of the facility, as well as attenuative properties of the aquifer. Applicants preparing corrective action plans must have a thorough understanding of the hydrogeologic system around the facility, in order to develop a monitoring plan and design the correction plan. Specific application information requirements for these concerns are addressed in later sections of this manual. The report should be prepared by a qualified hydrogeologist and should include:

- A description of the regional geologic and hydrogeologic characteristics in the vicinity of the facility. This information is generally obtainable from published or open-file documents from Federal, State or local agencies, and from the professional literature.
- An analysis of any topographic or geomorphic features that might influence the ground-water flow system. (Note that stereoscopic analysis of aerial photographs can aid in this analysis.)
- A classification and description of the hydrogeologic properties (hydraulic conductivity, porosity, texture, thickness, etc.) of all of the hydrogeologic units found at the site (i.e., the aquifers and any intervening saturated and unsaturated units). This classification should be as consistent as possible with the classifications used in the regional review.
- Using the §270.14(b)(19) topographic map as a base, isopach and structural contour maps and/or geologic sections showing the extent of the hydrologic units contained in the uppermost aquifer, and any intervening aquitards or other soil units within the facility property boundary.

- A description of water level or fluid pressure monitoring, including: (a) water level contour maps or vertical sections, (b) well or piezometer hydrographs, and (c) an interpretation of the flow system, including the vertical and horizontal components of flow.
- A description of the field methods used in the study, and a summary of which data were collected by each method.

Each of the above elements is discussed in more detail in the Permit Writer's Guidance Manual for Subpart F, Ground-Water Protection (Reference 1). EPA has also established standard methods for determining hydraulic conductivity in Test Methods for Hydraulic Conductivity, Leachate Conductivity, and Intrinsic Permeability (see Section 3.0 of this manual). These test methods should be reviewed before conducting any field investigations.

9.4 WASTE MANAGEMENT AREA, POINT OF COMPLIANCE, AND WELL LOCATIONS

9.4.1 The Federal Requirement

Section 270.14(b)(19) identifies the type of topographic map, and map information to be submitted in the permit application.

Section 270.14(c)(3) states:

> On the topographic map required under paragraph (b)(19) of this section, a delineation of the waste management area, the property boundary, the proposed "point of compliance" as defined under §264.97 and, to the extent possible, the information required in paragraph (c)(2) of this section.

Section 270.14(c)(2) requires the identification of the uppermost aquifer (see Section 9.3).

Section 264.95(b) describes "waste management area" as:

> (b) The waste management area is the limit projected in the horizontal plane of the area on which waste will be placed during the active life of a regulated unit.
>
> (1) The waste management area includes horizontal space taken up by any liner, dike, or other barrier designed to contain waste in a regulated unit.
>
> (2) If the facility contains more than one regulated unit, the waste management area is described by an imaginary line circumscribing the several regulated units.

Section 264.95(a) describes "point of compliance" as:

> (a) The Regional Administrator will specify in the facility permit the point of compliance at which the ground-water protection standard of §264.92 applies and at which monitoring must be conducted. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated units.

- Section 264.97 establishes general ground-water monitoring requirements. It is too long to reprint here. The reader should consult the regulations for the complete text.

9.4.2 Guidance to Achieve the Part 264 Standard

The applicant should read the preamble to Part 264, Subpart F for a complete discussion of the nature of the waste management area and point of compliance (see 47 FR 3228832299). Some important considerations are presented below.

9.4.2.1 Waste Management Area --

The "waste management area" is described by the collection of "regulated units" at the facility. A regulated unit is any "waste management unit" that has or will receive hazardous wastes after January 26, 1983 (the effective date of the Part 264

Land Disposal Permitting Standards). Section 3.0 of this manual provides additional discussion on the definition of regulated units.

A waste management unit is generally synonymous with a surface impoundment, waste pile, land treatment unit, or landfill cell. It is a contiguous area of land on or in which waste is placed. Landfills may present an exception to this general rule. A landfill can be designed as a collection of separately lined trenches with each individual trench considered to be a separate waste management unit. A waste management unit can be a regulated unit even though it contains predominantly non-hazardous waste or hazardous waste which was disposed prior to January 26, 1983.

The waste management area is made up of one or more waste management units that have received hazardous wastes after January 26, 1983 (i.e., regulated units). The waste management area is the area on which waste will be placed during the active life of the regulated unit. It includes any horizontal space taken up by barriers designed to contain waste, such as dikes. Where there are more than one regulated units, the waste management area is described by an imaginary line circumscribing these regulated units.

9.4.2.2 Point of Compliance --

The "point of compliance" is a vertical surface located at the hydraulically downgradient limit of the waste management area, extending from the Earth's surface down into the uppermost aquifer. The point of compliance is, in fact, a set of points (or surface). It is the location along which the Ground Water Protection Standard (see §264.92) must be met, and at which detection monitoring wells are located. The Regional Administrator will specify the location of the point of compliance in the permit after evaluation of the description of the waste management area and the nature of the hydrogeology of the site.

9.4.2.3 Monitoring Well Locations --

The ground-water monitoring system required by §264.97 is discussed in Section 9.6 for Detection Monitoring Programs and in Section 9.7 for Compliance Monitoring Programs. These Sections describe in detail how monitoring well locations should be determined. In general, monitoring wells must be located along the point of compliance. Their open intervals must be within the uppermost aquifer, as determined by site investigations and design evaluations.

9.4.3 Guidance to Address the Application Information Requirement

9.4.3.1 Waste Management Area --

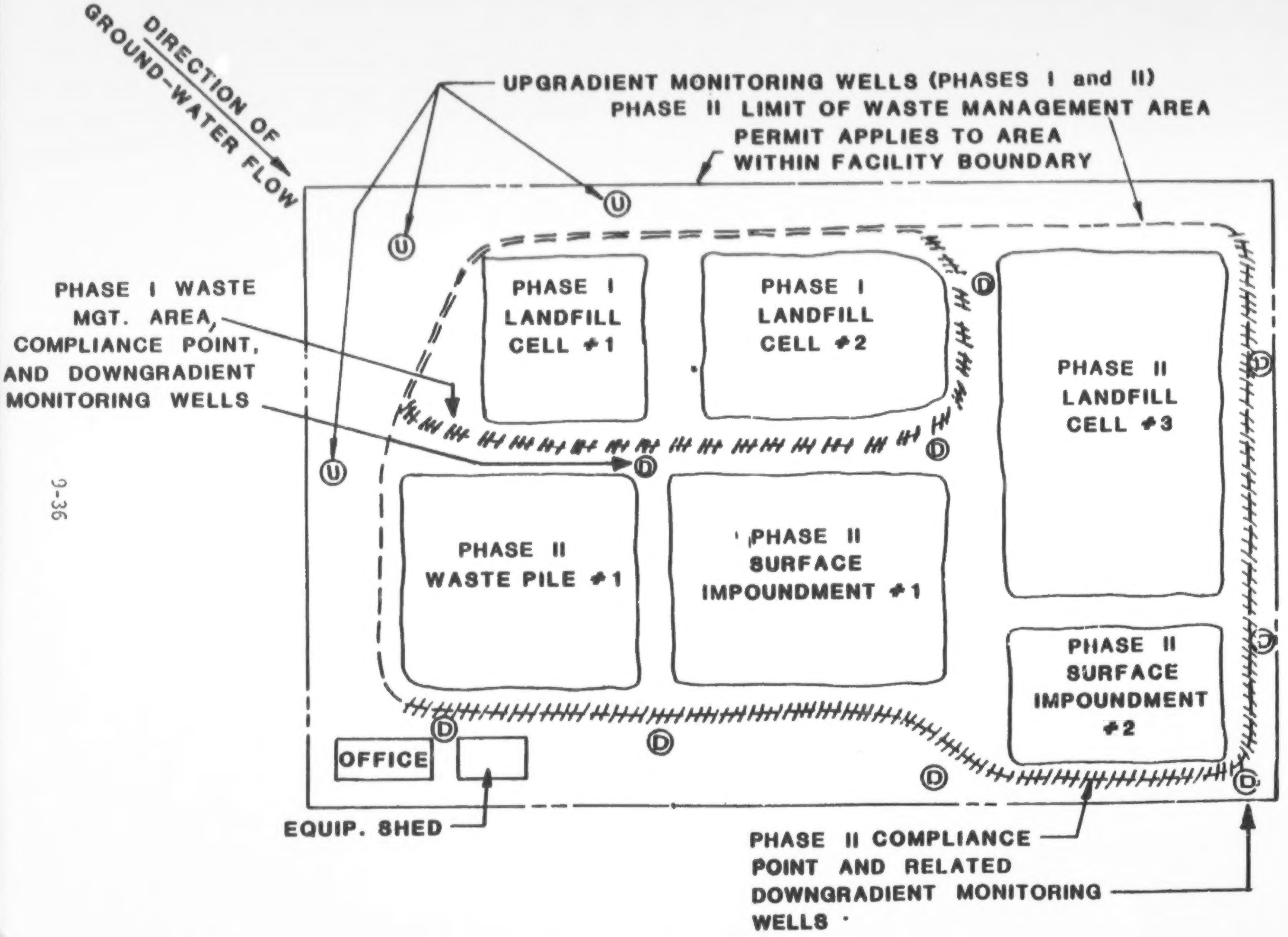
The applicant should define the waste management area on the topographic map prepared for §270.14(b)(19). The waste management area is easily described for facilities that will contain only one regulated unit. It is simply the area occupied by this unit and any barriers used to contain the waste. When several adjacent regulated units are present, the waste management area is described by a line circumscribing, or encompassing, these units (See Figure 3-1). If the permittee of a facility will add new units adjacent tc the existing units, the existing waste management area will expand to encompass the new units. Similarly the compliance point will move if the new units are downgradient from the existing units. This situation requires new downgradient monitoring wells (See Figure 9-4). Applicants should not propose a point of compliance that is geographically remote from the waste handling area. Rather the downgradient monitoring wells should be closely associated with the regulated units.

If new units at an expanded facility are remote from existing units, an expanded waste management area and compliance point are required to encompass the remote units. However, new downgradient (and possible new upgradient) wells will probably be necessary even though the entire area was included in the original permit because this area is not adjacent to existing units (see Figure 9-5).

Figure 9-6 illustrates a recommended approach for new facilities It involves initial operations at the compliance point. Later expansion proceeds upgradient. Thus, only one set of monitoring wells is needed. This approach may be applicable to some existing facilties. This approach may reduce costs for the permittee since only one set of monitoring wells is required. If this approac is not used, the concept of an expanding waste management area and moving compliance point and downgradient monitoring wells shown in Figure 9-4 applies.

9.4.3.2 Point of Compliance --

The permit applicant should propose the point of compliance on the map showing the waste management area. The applicant


DIRECTION OF GROUND-WATER FLOW
UPGRADIENT MONITORING WELLS (PHASES I and II)
PHASE II LIMIT OF WASTE MANAGEMENT AREA
PERMIT APPLIES TO AREA WITHIN FACILITY BOUNDARY
PHASE I WASTE MGT. AREA, COMPLIANCE POINT, AND DOWNGRADIENT MONITORING WELLS
PHASE I LANDFILL CELL #1
PHASE I LANDFILL CELL #2
PHASE II LANDFILL CELL #3
PHASE II WASTE PILE #1
PHASE II SURFACE IMPOUNDMENT #1
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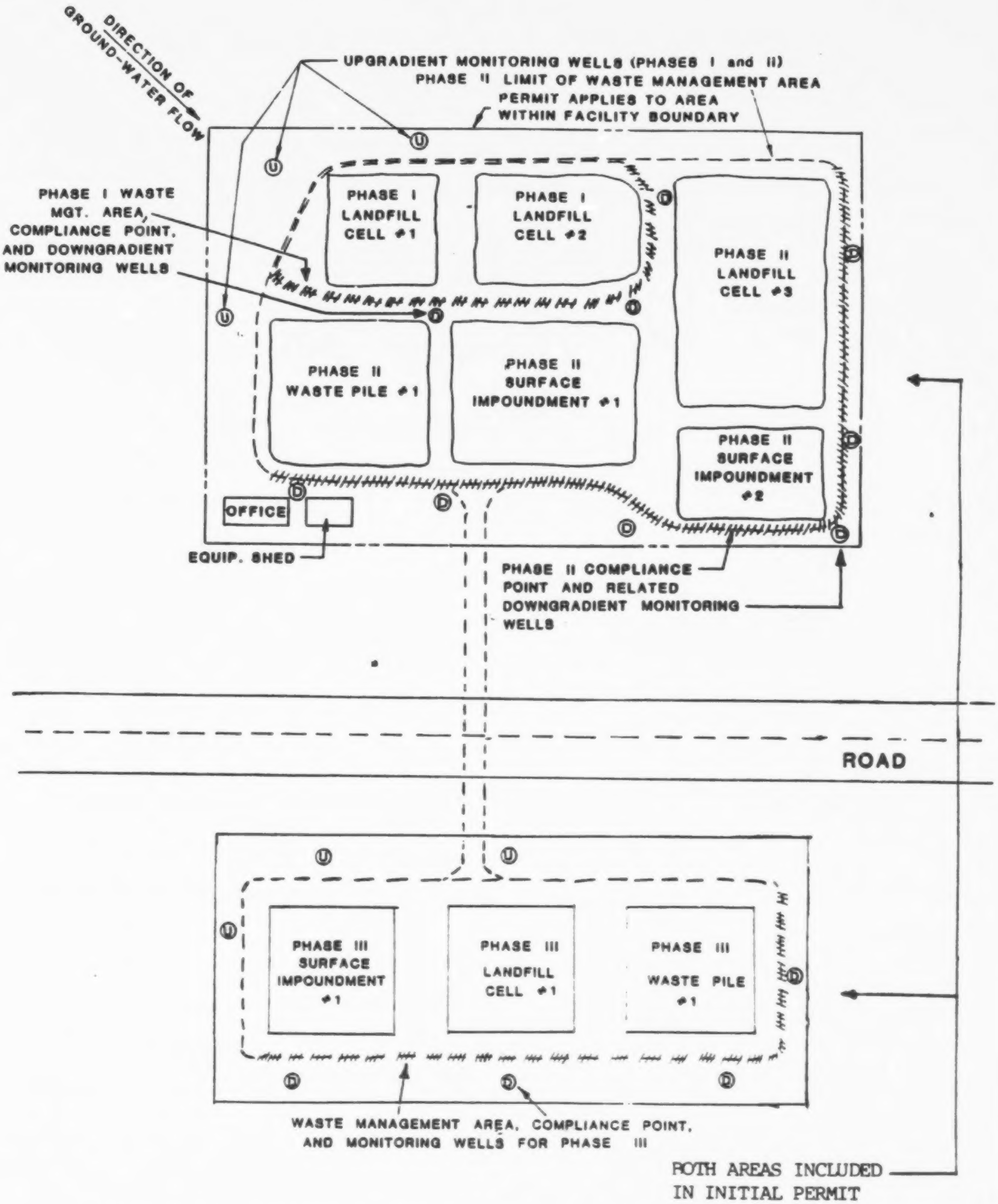
DIRECTION OF GROUND-WATER FLOW
UPGRADIENT MONITORING WELLS (PHASES I and II)
PHASE II LIMIT OF WASTE MANAGEMENT AREA
PERMIT APPLIES TO AREA WITHIN FACILITY BOUNDARY
PHASE I WASTE MGT. AREA, COMPLIANCE POINT, AND DOWNGRADIENT MONITORING WELLS
PHASE I LANDFILL CELL #1
PHASE I LANDFILL CELL #2
PHASE II LANDFILL CELL #3
PHASE II WASTE PILE #1
PHASE II SURFACE IMPOUNDMENT #1
PHASE II SURFACE IMPOUNDMENT #2
OFFICE
EQUIP. SHED
PHASE II COMPLIANCE POINT AND RELATED DOWNGRADIENT MONITORING WELLS
ROAD
PHASE III SURFACE IMPOUNDMENT #1
PHASE III LANDFILL CELL #1
PHASE III WASTE PILE #1
WASTE MANAGEMENT AREA, COMPLIANCE POINT, AND MONITORING WELLS FOR PHASE III
BOTH AREAS INCLUDED IN INITIAL PERMIT
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D

Figure 9-5. Concept of Separate Waste Management Compliance Points, and Monitoring Wells for Remote Areas Within Same Permit Boundary.

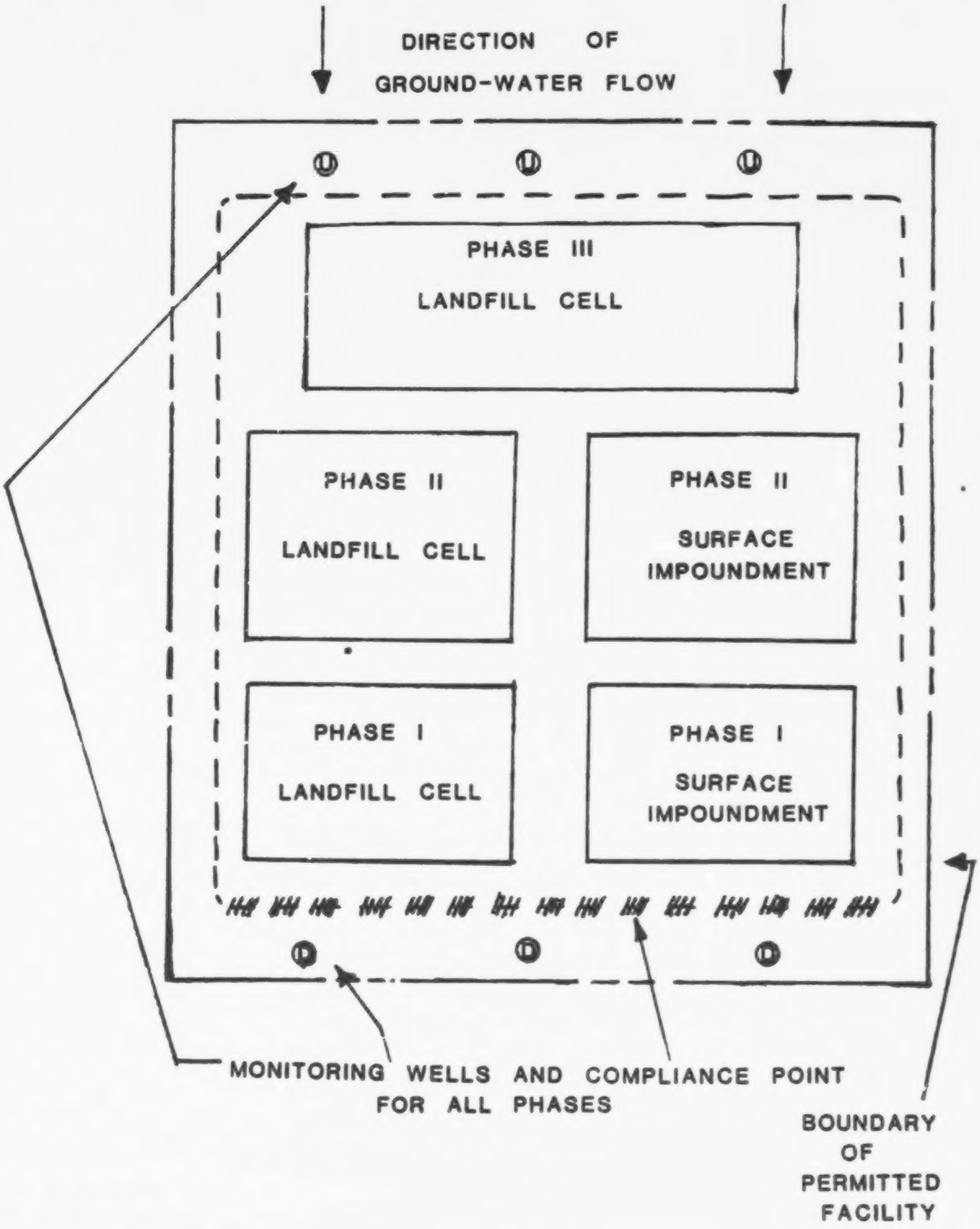
DIRECTION OF
GROUND-WATER FLOW
PHASE III
LANDFILL CELL
PHASE II
LANDFILL CELL
PHASE II
SURFACE
IMPOUNDMENT
PHASE I
LANDFILL CELL
PHASE I
SURFACE
IMPOUNDMENT
MONITORING WELLS AND COMPLIANCE POINT
FOR ALL PHASES
BOUNDARY
OF
PERMITTED
FACILITY

Figure 9-6. Recommended Operational Approach - First Phase Operations at Compliance Point.

must support this proposal by showing that this surface is hydraulically downgradient of the waste management area. Guidance on this topic is presented in Section 9.3 of this manual.

The point of compliance depth should extend to the base of the lowest relatively permeable unit of the uppermost aquifer. Additional guidance on determining the location and depth of the point of compliance is provided in the Permit Writer's Guidance Manual for Subpart F, Ground-Water Protection (Reference 1).

9.4.3.3 Monitoring Well Locations --

The applicant should indicate the locations of the proposed monitoring wells on the map developed under §270.14(b)(19). Guidance for establishing these locations is presented in Sections 9.6 and 9.7 of this manual.

9.4.3.4 Hydrogeologic Information --

The permit applicant should show, to the extent possible, the information required by §270.14(c)(2) on the base map noted below. Section 9.3 of this manual provides guidance on obtaining this information. As an example, a contour map of the ground-water table should be presented on the map prepared for §270.14(b)(19) (use additional copies of this base map if all the information cannot be presented on one sheet). This map may also present surficial geologic and soils information.

9.5 DESCRIPTION OF ANY GROUND-WATER CONTAMINATION

9.5.1 The Federal Requirement

Section 270.14(c)(4) states:

> A description of any plume of contamination that has entered the ground water from a regulated unit at the

time that the application is submitted that:

> (i) Delineates the extent of the plume on the topographic map required under paragraph (a)(19) of this section;
>
> (ii) Identifies the concentration of each Appendix VIII of Part 261 of this chapter constituent throughout the plume or identifies the maximum concentrations of each Appendix VIII constituent in the plume.

Definitions from §260.10 include:

> 'Constituent' or 'hazardous waste constituent' means a constituent which caused the Administrator to list the hazardous waste in Part 261, Subpart D, of this chapter, or a constituent listed in Table 1 of §261.24 of this chapter.
>
> 'Ground water' means water below the land surface in a zone of saturation.

The reader should consult the regulations for a list of the constituents contained in Appendix VIII of Part 261.

9.5.2 Guidance to Achieve the Part 264 Standard

Section 270.14(c)(4) requires the applicant to describe the nature and extent of any ground-water contamination attributable to a regulated unit. The reader should review Section 9.4 for description of a regulated unit. This standard does not apply to new facilities. This requirement also applies to owners and operators required to conduct corrective actions (see §264.100(e)).

As described at 47 FR 32292, there may be situations where it will be difficult to tell if a plume originates at a regulated unit, or if it originates at an adjacent, upgradient waste management unit which may or may not also be a regulated unit, or from another source. The regulations provide that any waste constituent that migrates beyond the compliance point is presumed to come from a regulated unit. The permit applicant may overcome this presumption if he demonstrates, with monitoring data or other information, that the constituents are coming from another source, such as an adjacent, upgradient waste management unit which is not also a regulated unit.

The Interim Status ground-water monitoring requirements (§265.90-265.94) do not require the permittee to monitor for the constituents listed in Appendix VIII of Part 261. Rather, general parameters describing ground-water quality and indicators of contamination are monitored. Should such monitoring and attendant data comparison indicate a significant difference in downgradient water quality compared with background, the permittee is required to conduct a general assessment of the extent of contamination. This assessment, in most cases, would not be likely to include analysis of all of the Appendix VIII constituents. In addition, the triggering mechanism for this assessment is the use of the Student's t-test at the 0.01 level of significance. The statistical procedure used for 264 Subpart F is a modification of the Student's t-test at the 0.05 level of significance. This latter procedure is more likely to indicate the presence of a constituent.

9.5.3 Guidance to Address the Application Information Requirement

The relationship of this standard to the Interim Status ground-water monitoring program may be confusing to many applicants. The standard can be applied to cases where no Interim Status ground-water monitoring data are available, and to cases where Interim Status monitoring shows the presence of hazardous constituents downgradient from the regulated units. It is also particularly relevant to facilities at which corrective action measures are necessary; the information will form the basis for the corrective action plan.

Applicants should address this requirement in light of the following points:

- If the Interim Status monitoring indicates a significant increase (or decrease in the case of pH) in any parameter downgradient from the regulated unit(s), or if it indicates the presence of any hazardous constituent at the compliance point above background concentration, the applicant should address the instruction requirements of §270.14(c)(4).

- EPA will review and evaluate the Interim Status ground-water monitoring program conducted by the applicant at the facility, using, in part, the information assembled under Section 9.2. EPA will evaluate the effectiveness of the monitoring well network design in determining the presence of any plume associated with a regulated unit. EPA will also evaluate the effectiveness of the ground-water sampling and analysis program to detect and identify the presence of hazardous constituents, regardless of whether a statistically significant increase in the monitoring parameters (or significant change in the case of pH) has been identified. EPA will also evaluate the results of any assessment plan conducted under the Interim Status rules.

- If these evaluations indicate, to the satisfaction of the Regional Administrator, that there is no plume of contamination in the ground water from a regulated unit, the applicant will not be expected to address §270.14(c)(4) any further. Instead, the permit application will be processed under the Part 264 Detection Monitoring Program standards (see Section 9.6).

- If these evaluations indicate to the Regional Administrator that the Interim Status ground-water monitoring program cannot adequately determine whether a plume of contamination has entered the ground water from a regulated unit, he will direct the applicant to implement a ground-water monitoring program which satisfies §264.97, §264.98, and §270.14(c)(4) at once. Alternately, the Regional Office may issue a compliance order under the Interim

> Status program that directs the applicant to collect information describing the nature of any ground-water contamination within the site. The applicant must then obtain data on ground-water quality responsive to §270.14(c)(4) for use in determining how the facility should be permitted under the Part 264, Subpart F system.

Applicants should discuss their Interim Status ground-water monitoring program with the Regional Office at their earliest opportunity prior to submitting a Part 264 permit application. When it is necessary for the applicant to fully address §270.14(c)(4), as outlined above, the following information will be useful:

- Techniques useful for describing the extent of a plume are described in Section 3 of Ground-Water Monitoring Guidance for Owners and Operators of Interim Status Facilities (U.S.EPA; SW-963; October, 1982). Indirect methods, such as earth resistivity, may be useful in many cases. The applicant should delineate the extent of the plume on the map prepared under §270.14(b)(19). The applicant should also attempt to describe the vertical distribution of the plume through the use of hydrogeologic cross-sections.
- Except where constituent concentrations are very high (in the ten ppm or more range), it should be sufficient to indicate the peak concentrations of each constituent, rather than assembling isoconcentration contour maps for each constituent.

9.6 DETECTION MONITORING PROGRAM

The application information requirements in §270.14(c)(5) and §270.14(c)(6) are closely related, and are treated together in this section.

9.6.1 The Federal Requirement

Section 270.14(c)(5) states:

> Detailed plans and an engineering report describing the proposed ground-water monitoring program to be implemented to meet the requirements of §264.97

Section 270.14(c)(6) indicates that:

> If the presence of hazardous constituents has not been detected in the ground water at the time of permit application, the owner or operator must submit sufficient information, supporting data, and analyses to establish a detection monitoring program which meets the requirements of §264.98. This submission must address the following items as specified under §264.98:
>
> (i) A proposed list of indicator parameters, waste constituents, or reaction products that can provide a reliable indication of the presence of hazardous constituents in the ground water;
>
> (ii) A proposed ground-water monitoring system;
>
> (iii) Background values for each proposed monitoring parameter or constituent, or procedures to calculate such values; and
>
> (iv) A description of proposed sampling, analysis and statistical comparison procedures to be utilized in evaluating ground-water monitoring data."

Section 264.97 and §264.98 are too long to reprint here. The reader should consult the regulations at 47 FR 32352 and 32353, respectively.

9.6.2 Guidance to Achieve the Part 264 Standard

The Preamble discussions of the detection monitoring program under §264.98, and the general ground-water monitoring requirements under §264.97 are found at 47 FR 32304 and 32300, respectively. A detection monitoring program will be specified by the Regional Administrator in the case of new sites and for Interim Status sites when the presence of hazardous constituents has not been detected in the ground water. Evidence of the presence of hazardous constituents may be based on previous monitoring under the Interim Status Standards, on the results of a site investigation undertaken outside the scope of Interim Status monitoring, or on data collection in response to permit application preparation under Part 264.

The objective of a detection monitoring program is to provide the earliest possible indication that regulated units are leaking into the uppermost aquifer. The permittee must conduct monitoring semi-annually at the point of compliance specified under §264.95. This monitoring involves a regular program of sampling and analysis for parameters which provide an indication of the presence of hazardous constituents. These results are compared to background values of these parameters using a specific statistical procedure. When this process indicates a statistically significant decrease in downgradient ground-water quality (which is reported to the Regional Administrator), the permittee may attempt to show that the decrease is due to a deterioration in water quality unattributable to the facility or due to errors in sampling analysis or evaluation. Otherwise, the change is assumed to be the result of leakage from the regulated units.

In such an event, the permittee must notify the Regional Administrator, and submit an application for a permit modification. This permit modification application must include specific information on the nature of the change in ground-water quality, and must address the information requirements for a compliance monitoring program permit and an engineering feasibility plan for a corrective action program (see §264.98(h)(4) and (5)). In issuing a permit modification, the Regional Administrator will specify a ground-water protection standard (see §264.92), and may specify either a compliance monitoring program or a corrective action program, or some combination of the two. The requirements of a detection monitoring program are illustrated in Figure 9-7.

9.6.3 Guidance to Address the Application Information Requirement

To address these information requirements, the applicant should provide as detailed a presentation of the proposed monitoring program as possible. The Regional Administrator must specify explicit requirements on the design of the monitoring system, parameter analyses, data comparison methods, and response requirements in the permit.

It is suggested that the applicant develop and present the proposed Detection Monitoring Program as a group of related, but distinct attachments to the application. These attachments should be identified one from the other, but all should be identified as part of the Detection Monitoring Program. For example, the attachments might be named DMP-1, DMP-2, or DET-1, DET-2, etc. Suggested attachments include the following:

- Map of Detection Monitoring Wells
- Plans and Specifications for Detection Monitoring Wells
- Sampling Techniques Including Flow Rate and Direction Determinations
- Sample Preservation and Shipping Procedures
- Parameters to be Monitered and Sample Analysis Protocols
- Sample Chain of Custody Procedures
- Procedures to Establish Background Values for Ground Water

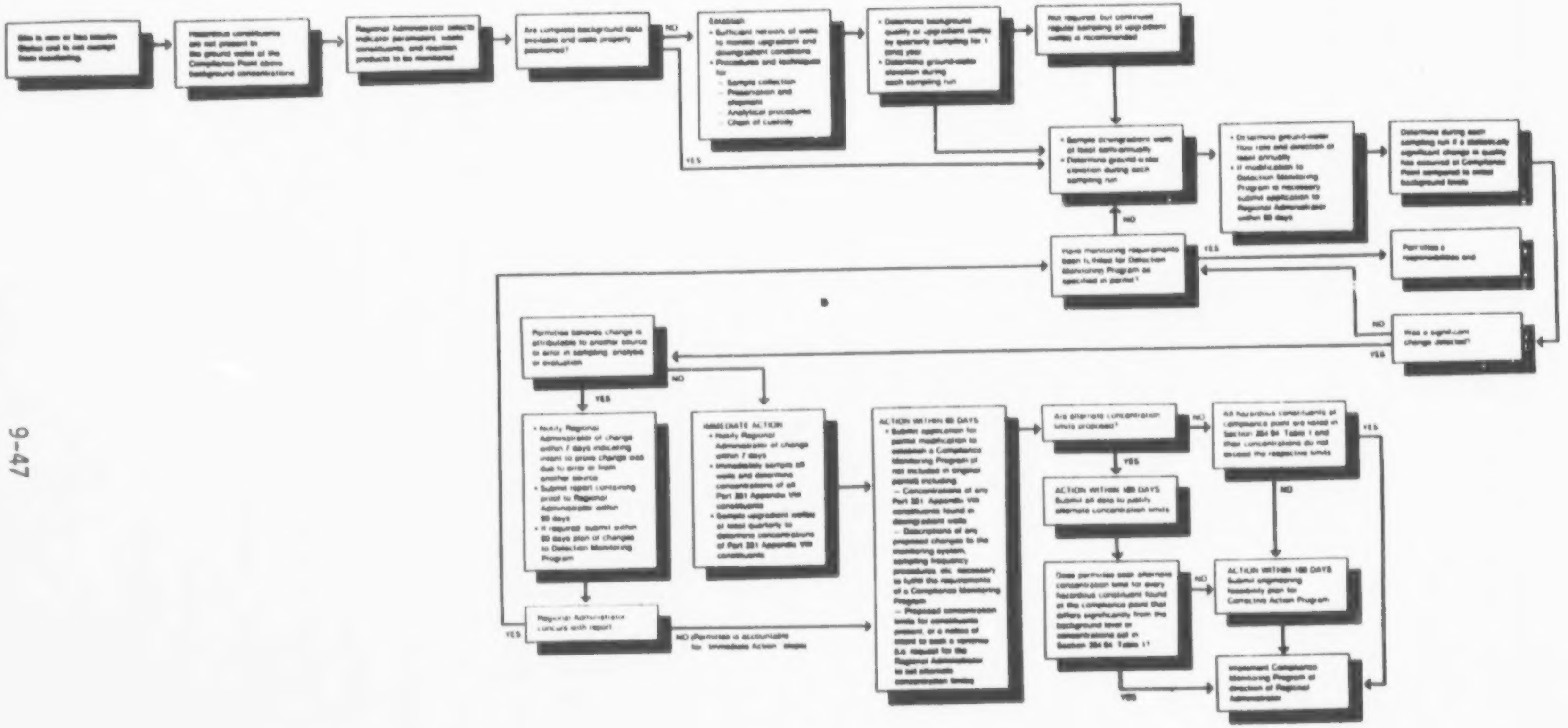
Hazardous constituents are not present in the ground water of the Compliance Point above background concentrations
Regional Administrator selects indicator parameters, waste constituents, and reaction products to be monitored
Are complete background data available and wells properly positioned?
NO
YES
Establish:
• Sufficient network of wells to monitor upgradient and downgradient conditions
• Procedures and techniques for:
– Sample collection
– Preservation and shipment
– Analytical procedures
– Chain of custody
• Determine background quality of upgradient wells by quarterly sampling for 1 (one) year
• Determine ground-water elevation during each sampling run
Not required, but continued regular sampling of upgradient wells is recommended
• Sample downgradient wells at least semi-annually
• Determine ground-water elevation during each sampling run
• Determine ground-water flow rate and direction at least annually
• If modification to Detection Monitoring Program is necessary submit application to Regional Administrator within 90 days
Determine during each sampling run if a statistically significant change in quality has occurred at Compliance Point compared to initial background levels
Have monitoring requirements been fulfilled for Detection Monitoring Program as specified in permit?
NO
YES
Permittee's responsibilities end
Was a significant change detected?
NO
YES
Permittee believes change is attributable to another source or error in sampling, analysis or evaluation
YES
NO
• Notify Regional Administrator of change within 7 days indicating intent to prove change was due to error or from another source
• Submit report containing proof to Regional Administrator within 90 days
• If required, submit within 90 days plan of changes to Detection Monitoring Program
IMMEDIATE ACTION
• Notify Regional Administrator of change within 7 days
• Immediately sample all wells and determine concentrations of all Part 261 Appendix VIII constituents
• Sample upgradient wells at least quarterly to determine concentrations of Part 261 Appendix VIII constituents
Regional Administrator concurs with report
YES
NO (Permittee is accountable for Immediate Action steps)
ACTION WITHIN 90 DAYS
• Submit application for permit modification to establish a Compliance Monitoring Program (if not included in original permit) including:
– Concentrations of any Part 261 Appendix VIII constituents found in downgradient wells
– Descriptions of any proposed changes to the monitoring system, sampling frequency, procedures, etc. necessary to fulfill the requirements of a Compliance Monitoring Program
– Proposed concentration limits for constituents present, or a notice of intent to seek a variance (i.e. request for the Regional Administrator to set alternate concentration limits)
Are alternate concentration limits proposed?
YES
NO
ACTION WITHIN 180 DAYS
Submit all data to justify alternate concentration limits
Does permittee seek alternate concentration limit for every hazardous constituent found at the compliance point that differs significantly from the background level or concentrations set in Section 264.94 Table 1?
YES
NO
All hazardous constituents at compliance point are listed in Section 264.94 Table 1 and their concentrations do not exceed the respective limits
YES
NO
ACTION WITHIN 180 DAYS
Submit engineering feasibility plan for Corrective Action Program
Implement Compliance Monitoring Program at direction of Regional Administrator

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Figure 9-7. Detection monitoring program requirements.

- Statistical Procedures Used to Evaluate Changes in Ground Water Parameters

9.6.3.1 Proposed List of Monitoring Parameters --

The applicant should propose a list of parameters to be used in monitoring at the point of compliance. The Agency will attempt to minimize the permittee's burden through the use of carefully selected indicator parameters, rather than a comprehensive list of hazardous constituents. The proposed parameters should be capable of indicating the presence of hazardous constituents in the ground water. In some cases, parameters that signal the presence of leachate are a less expensive means to indicate the presence of hazardous constituents than analyzing for the constituents themselves. The difference between these two groups is that the indicator parameters (such as Total Organic Halogen or TOX) do not identify the presence of specific chemical compounds, but rather signal the presence of a family of similar compounds.

However, the natural background variability of some indicator parameters (such as Total Organic Carbon (TOC), specific conductance and pH) may hinder statistical detection of some pollutants released at low concentration levels from the facility. Consequentl most applicants should propose a list of monitoring parameters that includes specific hazardous constituents (chemical compounds) and/or their reaction products as well as general parameters that serve as indicators of the presence of leachate (e.g., TOC, TOX, specific conductance, pH, color, TDS, temperature). In developing this list, the following items should be considered:

- The nature of the wastes managed at the facility should be reviewed, to determine which constituents (and any reaction products if this chemical process is understood) are relatively mobile and persistent. The results of this review should be submitted along with the list of monitoring parameters.
- The effects of the unsaturated zone (if present) beneath the facility on the mobility, stability and persistence of the waste constituents
- The detectability of the parameters
- The concentrations and coefficients of variability of the proposed parameters in background groundwater quality

A useful reference on the mobility and fate of hazardous constituents is Water-Related Fate of 129 Priority Pollutants, Reference (2). Further guidance on the selection of monitoring parameters is given in the Permit Writer's Guidance Manual for Subpart F, Ground-Water Protection (Reference 1).

9.6.3.2 Proposed Ground-Water Monitoring System --

The permit applicant should propose, in detail, the individual elements of the monitoring system to be used during detection monitoring. The design of the system; including the number, location, and open (or screened) intervals of all upgradient and downgradient wells must be clearly indicated. In addition, the design features and construction procedures for each monitoring well, including drilling methods, well casing and materials, well diameter, well intake design, well development procedures, and method for sealing the annular space must be clearly shown.

Guidance on the design of the monitoring network (i.e., the number, location and open interval) is provided in Chapter 3 of

Reference 1. The downgradient monitoring wells must be located along the point of compliance. Upgradient wells must be located in areas of the facility property that should not have any potential for ground-water contamination from the facility; such areas are typically upgradient from the facility. When such upgradient wells cannot be located at the site (usually because the facility straddles a ground water divide, or because there is not enough space between the facility and the upgradient property line), background wells must be installed in a nearby, hydrogeologically similar area unaffected by the facility. This problem is discussed in both Reference 1 and in Ground-Water Monitoring Guidance For Owners and Operators of Interim Status Facilities (SW-963).

The detection monitoring wells at the point of compliance should be installed at locations and depths most likely to intercept ground water contaminated by the regulated units. Design considerations include the relative hydraulic conductivity of the geologic materials beneath the facility. The Agency has not set any minimum for the number of wells, as was done under the Interim Status rules. Rather, the number must be established on a site specific basis. Large facilities may need more than three downgradient wells.

9.6.3.3 Background Values --

The applicant has two basic approaches for establishing background values. In the first approach, specific values for each parameter can be fixed in the permit. There are two ways to do this. Specific values (and their coefficients of variability) can be submitted for each proposed monitoring parameter. Or, in situations where background data are not available at the time of the application, (such as at new facilities, or where the Interim Status monitoring did not include determinations of all of the monitoring parameters proposed for use in the detection monitoring program), the applicant must propose a plan for establishing these values. Details of these methods are discussed later in this section.

In the second approach, ongoing sampling of upgradient wells could be used to continuously define background. This approach may be useful where upgradient off-site sources of contamination result in transient changes in ground-water quality.

Background values generally must be based on quarterly sampling over one year. In addition, the quarterly sampling must include at a minimum one sample from each background upgradient well, and four samples from the entire system of background wells. For example, if there are two background wells, each must be sampled twice during each quarterly sampling sampling event. Background values are to be expressed in a form suitable for the for the determination of a statistically significant change using the specified statistical procedure. For example, to use the procedure specified in the Part 264, Subpart F rules, the mean, variance and number of samples analyzed for each parameter must be recorded. Applicants should also supply all sample results, indicating the well number, replicate number, date sampled and parameter value. Applicants are encouraged to supply such a complete package of background information for each proposed monitoring parameter.

If it is necessary for the applicant to propose a plan for establishing background values, the plan should describe how the values will be established over the first year of the permit. The plan should indicate the wells and schedule to be used to collect the data, along with the calculations to be used to summarize the data. Unless a different statistical procedure than that described in Part 264, Subpart F is proposed, the applicant should follow the procedures outlined in the preceeding paragraph.

When the applicant proposes to conduct ongoing sampling of upgradient wells to define background, the Part 264, Subpart F statistical test may not be applicable. In such cases, the applicant should propose a specific statistical test, and indicate how it is comparable to the Part 264 test. The wells to be used, the sampling schedule, and the calculation procedures must similarly be proposed.

9.6.3.4 Sampling, Analysis and Statistical Procedures --

The applicant should propose a sampling and analysis plan that includes procedures for sample collection, sample preservation and shipment, analytical methods and chain of custody controls. Sample collection involves well evacuation and sample withdrawal methods. A principle objective is to insure that sample represents ground-water quality unaffected by well construction or sampling equipment. Guidance on designing a sample collection plan is provided in Manual of Ground-Water Quality Sampling Procedures (Reference 3), the Ground-Water Monitoring Guidance for Owners and Operators of Interim Status Facilities (SW-963) and Chapter 5 of Reference 1.

The applicant should indicate the analytical technique that will be used for each monitoring parameter. The methods specified in the most recent edition of Test Methods for Evaluating Solid Waste (SW-846) must be used unless a varience is sought under §260.21.

The applicant must also propose the statistical comparison procedure(s) to be used. Appendix IV of Part 264, Subpart F outlines the techniques presently specified as the standard method. The Agency believes that this method is applicable to a wide range of monitoring programs. But the Agency also recognizes that it is not applicable in some situations (see 47 FR 32274 through 32348). The Agency therefore allows the applicant the option of proposing alternative statistical techniques when appropriate. If the applicant proposes the standard technique, he must only show that the background data are compatible with its use. For alternative techniques, the applicant must describe the calculation procedure, state all underlying assumptions, and show that use of the method is consistent with available data on each monitoring parameter. In some cases, different statistical techniques will be applied to different monitoring parameters. In these cases, the applicant must clearly specify which statistical technique will be applied to each parameter.

9.7 COMPLIANCE MONITORING PROGRAM

The application information requirements in §270.14(c)(5) and §270.14(c)(7) are closely related, and are treated together in this section.

9.7.1 The Federal Requirement

Section 270.14(c)(5) states:

> Detailed plans and an engineering report describing the proposed ground-water monitoring program to be implemented to meet the requirements of §264.97

Section 270.14(c)(7) indicates that:

> If the presence of hazardous constituents has been detected in the ground water at the point of compliance at the time of permit application, the owner or operator must submit sufficient information, supporting data, and analyses to establish a compliance monitoring program which meets the requirements of §264.99. The owner or operator must also submit an engineering feasibility plan for a corrective action program necessary to meet the requirements of §264.100, except as provided in §264.98(h)(5). To demonstrate compliance with §264.99, the owner or operator must address the following items:
>
> (i) A description of the wastes previously handled at the facility;
>
> (ii) A characterization of the contaminated ground water, including concentrations of hazardous constituents;
>
> (iii) A list of hazardous constituents for which compliance monitoring will be undertaken in accordance with §264.97 and §264.99;
>
> (iv) Proposed concentration limits for each hazardous constituent, based on the criteria set forth in §264.94(a) including a justification for establishing any alternate concentration limits;
>
> (v) Detailed plans and an engineering report describing the proposed ground-water monitoring system, in accordance with the requirements of §264.97; and
>
> (vi) A description of proposed sampling, analysis and statistical comparison procedures to be utilized in evaluating ground-water monitoring data.

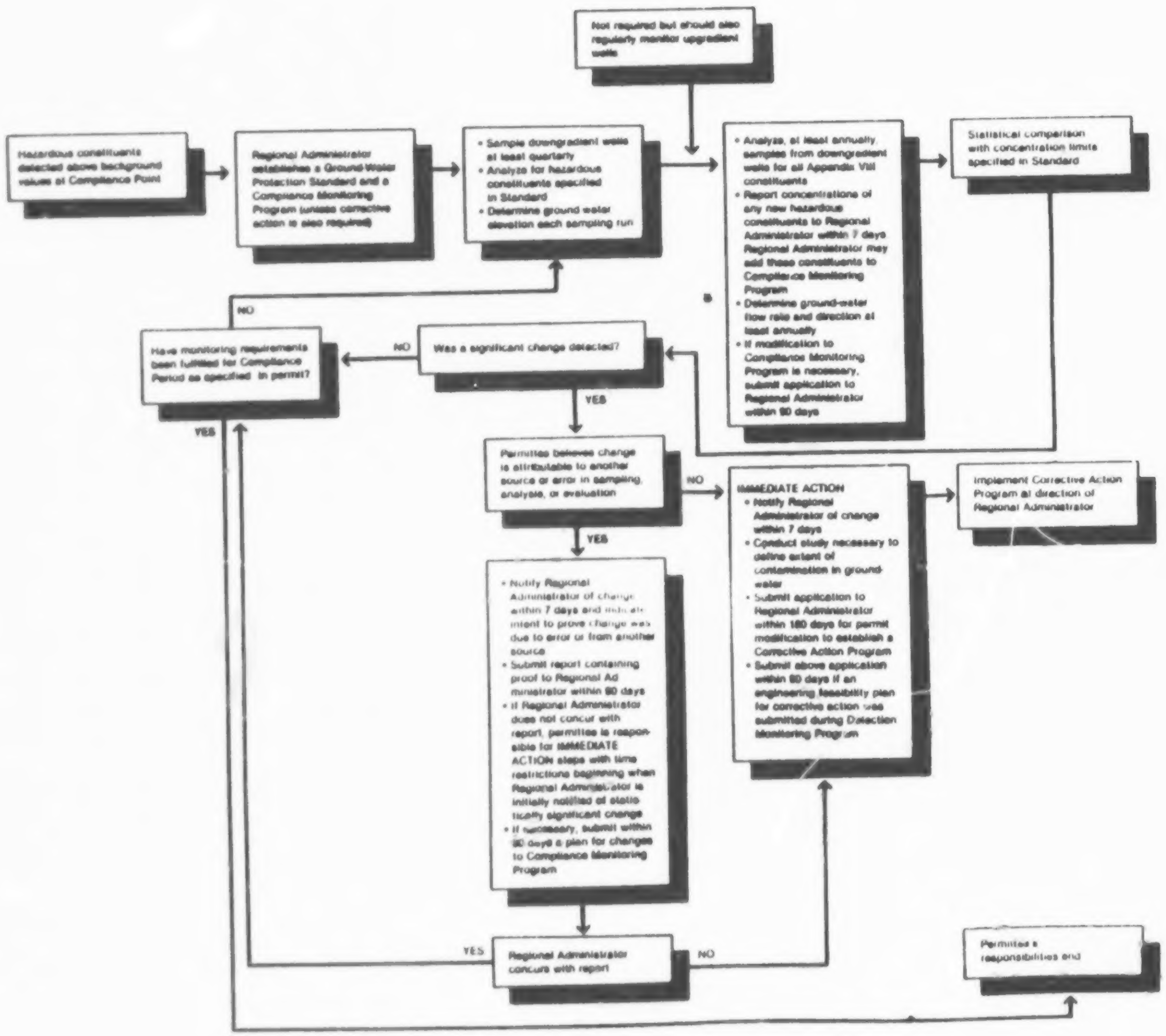
Sections 264.94(a), 264.97, 264.99 and 264.100 are too long to reprint here. The reader should consult the regulations for the complete text.

9.7.2 Guidance to Achieve the Part 264 Standard

The Preamble discussion of the compliance monitoring program under §264.99, and the general ground-water monitoring requirements under §264.97 are found at 47 FR 32308 and 32300, respectively. The discussion of the criteria for hazardous constituent concentration limits is found at 47 FR 32297. The scope of the corrective action program under §264.100 is found at 47 FR 32310.

When the permittee determines that hazardous constituents from a regulated unit have reached ground water, he must establish a compliance monitoring program. The evidence of the presence of hazardous constituents may be based on previous monitoring and/or assessment under Interim Status, on the results of a detection monitoring program, or on the results of investigations outside the scope of these monitoring programs. For some existing facilities that have not complied with the Interim Status requirements, and which pose a threat to human health and the environment, the Regional Administrator may require the permittee to submit an application for a compliance monitoring program. This program is illustrated in Figure 9-8.

Many features of the compliance monitoring program are analogous to those required in a detection monitoring program. The significant differences in the compliance monitoring program are described below.


Hazardous constituents detected above background values at Compliance Point
Regional Administrator establishes a Ground-Water Protection Standard and a Compliance Monitoring Program (unless corrective action is also required)
• Sample downgradient wells at least quarterly • Analyze for hazardous constituents specified in Standard • Determine ground water elevation each sampling run
Not required but should also regularly monitor upgradient wells
• Analyze, at least annually, samples from downgradient wells for all Appendix VIII constituents • Report concentrations of any new hazardous constituents to Regional Administrator within 7 days Regional Administrator may add these constituents to Compliance Monitoring Program • Determine ground-water flow rate and direction at least annually • If modification to Compliance Monitoring Program is necessary, submit application to Regional Administrator within 90 days
Statistical comparison with concentration limits specified in Standard
Was a significant change detected?
NO
YES
Have monitoring requirements been fulfilled for Compliance Period as specified in permit?
NO
YES
Permittee believes change is attributable to another source or error in sampling, analysis, or evaluation
NO
YES
IMMEDIATE ACTION • Notify Regional Administrator of change within 7 days • Conduct study necessary to define extent of contamination in ground-water • Submit application to Regional Administrator within 180 days for permit modification to establish a Corrective Action Program • Submit above application within 90 days if an engineering feasibility plan for corrective action was submitted during Detection Monitoring Program
Implement Corrective Action Program at direction of Regional Administrator
• Notify Regional Administrator of change within 7 days and indicate intent to prove change was due to error or from another source • Submit report containing proof to Regional Administrator within 90 days • If Regional Administrator does not concur with report, permittee is responsible for IMMEDIATE ACTION steps with time restrictions beginning when Regional Administrator is initially notified of statistically significant change • If necessary, submit within 90 days a plan for changes to Compliance Monitoring Program
Regional Administrator concurs with report
YES
NO
Permittee's responsibilities end

9.7.2.1 Ground-Water Protection Standard --

The compliance monitoring permit will include a Ground-Water Protection Standard under §264.92. This standard indicates when corrective action is necessary to control plumes of contamination that have emerged from a regulated unit. The standard has four principle elements:

- The hazardous constituents to be monitored and removed, if necessary (see §264.93)
- The concentration limits for each hazardous constituent that trigger corrective action (see §264.94)
- The point of compliance for measuring concentration limits (see §264.95)
- The compliance period (see §264.96)

Each of these four elements is briefly described below.

9.7.2.1.1 Hazardous Constituents -- Hazardous constituents to be monitored and removed, if necessary, are based on the list of constituents in Appendix VIII of Part 261. Appendix VIII is a list of hazardous constituents and classes of constituents that have been shown to have toxic, carcinogenic, mutagenic or teratogenic effects on humans or other life forms. EPA has prepared a Health and Environmental Effects Background Document on each constituent.

To select a hazardous constituent for inclusion in the standard, two additional criteria must be met. First, it must be in the ground water. Second, it must reasonably be expected to be in or derived from waste contained in a regulated unit. EPA will consider the presence of the constituent in the ground water at the compliance point as a sufficient initial indication that the constituent is derived from waste in a regulated unit.

The regulations allow the applicant two grounds for arguing that a constituent did not originate from a regulated unit. First, the waste handled may have relatively uniform chemical characteristics, and the applicant may show that it is impossible for certain constituents to ever appear in the leachate. If so, the Regional Administrator may conclude that the compound should not be a hazardous constituent. Second, the applicant may be able to show that the constituent found in the ground water is coming from a source other than the regulated unit(s), based on sufficient monitoring data and statistical comparisons with background values. Such a showing, however, is not a sufficient cause for deleting an Appendix VIII constituent from the list of hazardous constituents in the ground-water protection standard.

There is a limited variance opportunity in §264.93(b) for an applicant to ask the Regional Administrator to eliminate some constituents found in ground water from the list of hazardous constituents specified in the permit. Basically, the applicant must demonstrate that the constituent is not capable of posing a substantial threat to human health or the environment at any time under any circumstances, barring war or acts of God. An applicant cannot receive a variance by arguing that a plume would not reach potential users for some period of time. However, an applicant might demonstrate that, regardless of its concentration, because of its half-life and the slow rate of ground-water flow, the constituent can never pose a hazard to human health or the environment. Section

264.93(b) specifies a set of criteria which the Regional Administrator will consider when evaluating a variance request. The Regional Administrator will also consider any decisions made under §144.7 (the provision that allows for identification of Underground Sources of Drinking Water, under the Underground Injection Control Program, and exempted aquifers) in any decisions about ground-water use for purposes of this variance, to the extent that it is consistent with the ground-water protection strategy in the Part 264 standards.

9.7.2.1.2 Concentration Limits -- The second element of the ground-water protection standard is the establishment of concentration limits for each hazardous constituent. These limits are the action levels which trigger initiation of a corrective action program. EPA has used health-based contaminant limits, where such limits exist. The maximum contaminant limits established for the constituents in the National Interim Primary Drinking Water Regulations under the Safe Drinking Water Act will be used in the ground-water protection standard. Table 1 of §264.94 presents these values.

In those situations where there is no concentration limit specified for a hazardous constituent in the regulations (i.e., Table 1 of §264.94), and where the applicant fails to justify an alternate concentration limit under the variance (see §264.94(b)), the standard will specify that the concentration not exceed the background concentration in the ground water. If background water quality already exceeds the concentration specified for a Table 1 constituent, this "no increase over background" rule would apply to the constituent as well.

An applicant may request an alternate concentration limit under §264.94(b). Specific time frames are established for submitting information to justify this variance request. The Preamble discussion on alternate concentration limits is found at 47 FR 32298. The factors that the Regional Administrator will use in considering this variance are identical to the factors considered for the variance in §264.93, which allows exclusion of some Appendix VIII constituents from the groundwater protection standard. The reader should review the Preamble for more information on this topic, and for several examples that explain the variance in §264.94(b).

9.7.2.1.3 Point of Compliance -- The third element in the groundwater protection standard is the point of compliance. This topic is addressed in Section 9.4.

9.7.2.1.4 Compliance Period --The fourth element in the groundwater protection standard is the compliance period. In §264.96, the compliance period is set at the number of years equal to the active life of the waste management area, including any waste management activity prior to permitting, and the closure period. Note that the waste management area includes the individual waste management units and regulated units. The compliance period begins to run when the compliance monitoring program begins. The compliance period may extend beyond the number of years equal to the active life and closure period of the waste management area if corrective action has been initiated but not completed. A completion demonstration should include a showing, with monitoring data, that the ground-water protection standard has not been exceeded for a period of three consecutive years. The Preamble discussion on the compliance period is found at 47 FR 32299. Also note that the compliance period and the post-closure care period under §264.117 may not be coterminus, although the Regional Administrator may extend the post-closure care period to be coterminus with the compliance period.

9.7.2.2 Corrective Action Feasibility Plan --

An engineering feasibility plan for corrective action must be submitted under two circumstances. First, when the detection monitoring program shows that hazardous constituents have entered the ground water from a regulated unit, the permittee must, along with a permit modification application for a compliance monitoring program, submit a feasibility plan for corrective action (see §264.98(h)(5)). In this case, the permittee has 180 days to prepare the plan. The second case applies to any applicant applying for a compliance monitoring program permit (see §270.14(c)(7)).

There are two situations in either of the above cases for which a feasibility plan is not needed. First, if the only hazardous constituents are those listed in Table 1 of §264.94, and if their concentrations at the compliance point are below the limits specified in the Table, the plan is not required. Second, if the applicant (or permittee) has requested an alternate concentration limit (ACL) (under §264.94(b)) for every Appendix VIII constituent significantly above background, or above appropriat Table 1 values found at the point of compliance, the plan is not required. Rather, the Regional Administrator will make a decision on the ACL demonstration before requiring that the plan be submitte

When monitoring indicates that hazardous constituents are present in the ground water, EPA believes that corrective action is likely to be necessary. In many cases, the Regional Administrator will specify a corrective action program in conjunction with a compliance monitoring program. Thus, if correction action becomes necessary, the program can be initiated rapidly.

The feasibility plan does not need to detail every aspect of a corrective action program. Rather, it should show what general corrective action measures can be taken. The plan should be sufficiently specific to allow EPA to decide that the proposed corrective action program could work at the facility. Section 9.8 of this manual should be reviewed for information on the scope of corrective action programs. The Preamble discussion of corrective action feasibility plans is found at 47 FR 32307.

9.7.2.3 Compliance Point Monitoring - -

Sampling at the point of compliance wells must occur at least quarterly. This is more frequent than the minimum frequency for the detection monitoring program.

9.7.2.4 Duty to Search for Additional Hazardous Constituents - -

The permittee is required to sample and analyze the ground water to determine whether additional hazardous constituents besides those identified in the permit are present at the point of compliance. Ground-water samples must be analyzed for the Appendix VIII constituents at least annually. If additional constituents are found, the permittee must report this information to the Regional Administrator. It will then be up to the Regional Administrator to modify the permit by adding new hazardous constituents and appropriate concentration limits.

9.7.2.5 Response to Significant Increase - -

In the detection monitoring program, the response to finding a statistically significant change is the requirement to submit a permit modification application for a compliance monitoring program (which may, in addition, include certain corrective action requirements). In the compliance monitoring program, the response is the requirement to submit a permit modification application for a corrective action plan. The Preamble discussion on this topic is found at 47 FR 32309.

The permittee has 90 days to submit this application, unless either of the two situations under which a feasiblity plan is not required had occurred earlier (Section 9.7.2.2). In this latter case, the permittee has 180 days to submit the application. The contents of an application for a corrective action plan are discussed in Section 9.8 of this manual.

9.7.3 Guidance to Address the Application Information Requirement

To address the application information requirements, the applicant should provide as detailed a presentation of the proposed compliance monitoring program as possible. The Regional

Administrator must specify explicit requirements in the permit. It is suggested that the applicant develop and present the proposed Compliance Monitoring Program as a group of related, but distinct attachments to the application. These attachments should be identified one from the other, but all should be identified as part of the Compliance Monitoring Program. For example, the attachments might be named CMP-1, CMP-2, or COMP-1, COMP-2, etc. Suggested attachments include the following:

- List of Wastes Previously Handled
- Map of Compliance Monitoring Wells
- Plans and Specifications for Compliance Monitoring Wells
- Sampling Techniques Including Flow Rate and Direction Determination
- Sample Preservation and Shipping Procedures
- Sample Analysis Protocols
- Sample Chain of Custody Procedures
- Characterization of Ground Water
- Proposed Hazardous Constituent Concentration Limits
- Statistical Procedures Used to Evaluate Changes in Ground Water Parameters

9.7.3.1 Description of Wastes Previously Handled --

A description of the wastes previously handled at the facilit is required in the application. The information is needed to aid in the identification of hazardous constituents, to assure that the monitoring system is still appropriate, and to assess the feasibility of proposed corrective actions. This description should include:

- Historical records of volumes, types (including EPA ID number, if applicable), and chemical composition of wastes placed in units in the waste management area;
- The results of any direct sampling of the waste (see Test Methods for Evaluating Solid Waste, SW-846);
- A list of constituents that are reasonably expected to be in or derived from the waste; and
- Identification of the dominant constituents expected to be present, and their relative abundance.

Additionally, if it is expected that some constituents may form a separate, immiscible fluid, the composition of this fluid and its viscosity and density should be included in the application.

The applicant may also wish to review the waste characterization section of the Surface Impoundment, Waste Pile or Landfill sections of this Manual, as appropriate, as well as the Waste Analysis and Waste Analysis Plan sections of the Permit Applicant's Guidance Manual for the General Facility Standards.

9.7.3.2 Characterization of Contaminated Ground Water --

The permittee is required to characterize the contaminated ground water. For each well at the point of compliance, and for each background well, the applicant should provide:

- Concentrations of each constituent in Appendix VIII of Part 261;
- Concentrations of major anions and cations;and
- Concentrations of the constituents listed in Table 1 of §264.94, if not already determined by the above.

Determination of the concentration of all of the hazardous constituents in Appendix VIII can be expensive. The Agency is currently developing a hierarchial screening procedure for reducing the analysis burden. This procedure will be included in an update to Test Methods for Evaluating Solid Waste (SW-846). However, there currently is no waiver available for the requirement to analyze for all Appendix VIII constituents.

Where evidence of migration of hazardous constituents beyond the point of compliance exists, the applicant should also characterize the extent of the plume as required under §270.14(c)(4 if the hazardous constituent concentrations at downgradient wells exceed the ground-water protection standard. (see Section 9.5 of this manual).

9.7.3.3 Proposed Hazardous Constituent Concentration Limits --

The application must include a proposed list of hazardous constituents to be included in the Ground-Water Protection Standard. The permittee will monitor ground water at the point of compliance for these constituents. The regulatory criteria for identifying hazardous constituents are described in Section 9.7.2.1, as well as the options available to an applicant for seeking to exclude certain constituents.

The applicant should use the results from Section 9.7.3.1 (Description of Wastes Previously Handled) and from similar analyses of wastes currently handled (see the Waste Analysis sections for the sections of this manual addressing Surface Impoundments, Waste Piles, Land Treatment, and Landfills) in assembling this list. The applicant should present a rationale for the selection of the proposed hazardous constituents. This rationale should explain why the selected hazardous constituents, and not other constituents (which are also expected to be present in or derived from the wastes, and which have been identified in the ground water) are appropriate for inclusion in the Ground Water Protection Standard.

The applicant must also propose concentration limits for each of the proposed hazardous constituents. The regulatory criteria for concentration limits are described in Section 9.7.2.1. These criteria express the Agency's policy of allowing no degradation of water quality unless the applicant can demonstrate that no adverse public health and environmental effects will result.

Due to a lack of currently available standards based on health criteria, specific concentration limits for only a few constituents are specified in the regulations. These limits are the standards established in the National Interim Primary Drinking Water Regulatio and are listed in Table 1 of §264.94. If a hazardous constituent is not included in Table 1, or if its background concentration is above that allowed in Table 1, no degradation beyond background ground-water quality is allowed. In such cases, the concentration limit should be set at the background concentration of that hazardo constituent.

However, a specified amount of degradation beyond that allowed by §264.91 Table 1 or beyond background levels can be permitted by establishing alternate concentration limits. The criteria for establishing alternate concentration limits are discussed in Sectio 9.7.2.1.

Alternate concentration limits can be permitted only after the applicant makes a successful demonstration that the higher concentrations will not adversely affect public health and the environment. The demonstration may be based on:

- An assessment of health risks
- An analysis of attenuation mechanisms in the saturated zone
- Proof of discharge of all contaminated ground water to a surface water body prior to any opportunity for ground water use, and subsequent dilution to acceptable concentrations in the surface water

The applicant must provide sufficient and relevant data and analyses to support each proposed concentration limit. Guidance on setting alternate concentration limits is provided in Chapter 8 of Reference 1.

9.7.3.4 Ground-Water Monitoring System --

The applicant must provide complete information on the proposed ground water monitoring system. This system is essentially the same as the system used in the Detection Monitoring Program described earlier. The monitoring system includes well locations and designs.

For applicants seeking alternate concentration limits based on attenuation mechanisms or discharge to surface water, additional monitoring wells downgradient from the point of compliance may be necessary. This additional monitoring is required to verify the analyses used in setting the alternate concentration limits. Guidance on such additional monitoring needs is included in Chapters 3 and 8 of Reference 1.

9.7.3.5 Sampling, Analysis and Statistical Comparison Methods --

The applicant must present a description of the proposed sampling, analysis and statistical data comparison procedures to be used in the Compliance Monitoring Program. The required information is addressed in the discussion of the Detection Monitoring Program.

9.8 CORRECTIVE ACTION PROGRAM

The application information requirements in §270.14(c)(5) and §270.14(c)(8) are closely related, and are treated together in this section.

9.8.1 The Federal Requirement

Section 270.14(c)(5) requires:

> Detailed plans and an engineering report describing the proposed ground-water monitoring program to be implemented to meet the requirements of §264.97

Section 270.14(c)(8) states that:

> If hazardous constituents have been measured in the ground water which exceed the concentration limits established under §264.94 Table 1, or if ground-water monitoring conducted at the time of permit application under §§265.90-265.94 at the waste boundary indicates the presence of hazardous constituents from the facility in ground water over background concentrations, the owner or operator must submit sufficient information, supporting data, and analyses to establish a corrective action program which meets the requirements of §264.100.
>
> However, an owner or operator is not required to submit information to establish a corrective action program if he demonstrates to the Regional Administrator that alternate concentration limits will protect human health and the environment after considering the criteria listed in §264.94(b). An owner or operator who is not required to establish a corrective action program for this reason must instead submit sufficient information to establish a compliance monitoring program which meets the requirements of §264.99 and

> paragraph (c)(7) of this section. To demonstrate compliance with §264.100, the owner or operator must address, at a minimum, the following items:
>
> (i) A characterization of the contaminated ground water, including concentrations of hazardous constituents;
>
> (ii) The concentration limit for each hazardous constituent found in the ground water as set forth in §264.94;
>
> (iii) Detailed plans and an engineering report describing the corrective action to be taken; and
>
> (iv) A description of how the ground-water monitoring program will assess the adequacy of the corrective action."

The sections of Part 264 referenced in the above text are too long to reprint here. The reader should consult the regulations for the complete text.

9.8.2 Guidance to Achieve the Part 264 Standard

The Preamble discussion of the Corrective Action Program can be found at 47 FR 32310. There are basically two ways in which a permittee would conduct corrective action. In the first case, if hazardous constituents from a regulated unit exceed the Ground-Water Protection Standard (see §264.92) already established in a permit for that unit, the permittee must conduct a corrective action program designed to bring the unit back into compliance with the standard. Additionally, the permittee is responsible for determining if contamination has migrated beyond the compliance point and if so, must implement measures to correct contamination present between the compliance point and the downgradient facility boundary.

In the second case, if the ground water between the compliance point and the downgradient facility property boundary contains concentrations of hazardous constituents which exceed the concentration limits specified in §264.94, regardless of whether the facility has a permit or not, the owner or operator must submit a corrective action program permit application. This second case primarily applies to Interim Status facilities which have not yet been permitted under Part 264, and at which either Interim Status monitoring or the plume delineation under §270.14(c)(4) indicate the presence of such contaminated ground water. Owners or operators of these facilities should submit permit applications for corrective action programs.

A corrective action program may stand on its own in a permit, or may be specified in conjunction with a compliance monitoring program. In addition, a compliance monitoring program permit might include a generic corrective action plan on "stand-by", ready to be put into action if compliance monitoring results so require. Applicants for compliance monitoring program permits are required to submit engineering feasibility plans for corrective action programs as discussed in Section 9.7.

A permit issued for a corrective action program will include a Ground-Water Protection Standard for the regulated unit(s). Section 9.7 of this manual describes the nature of the Ground-Water Protection Standard; the applicant should refer to it for further information. Figure 9-9 illustrates the major steps associated with a corrective action program.

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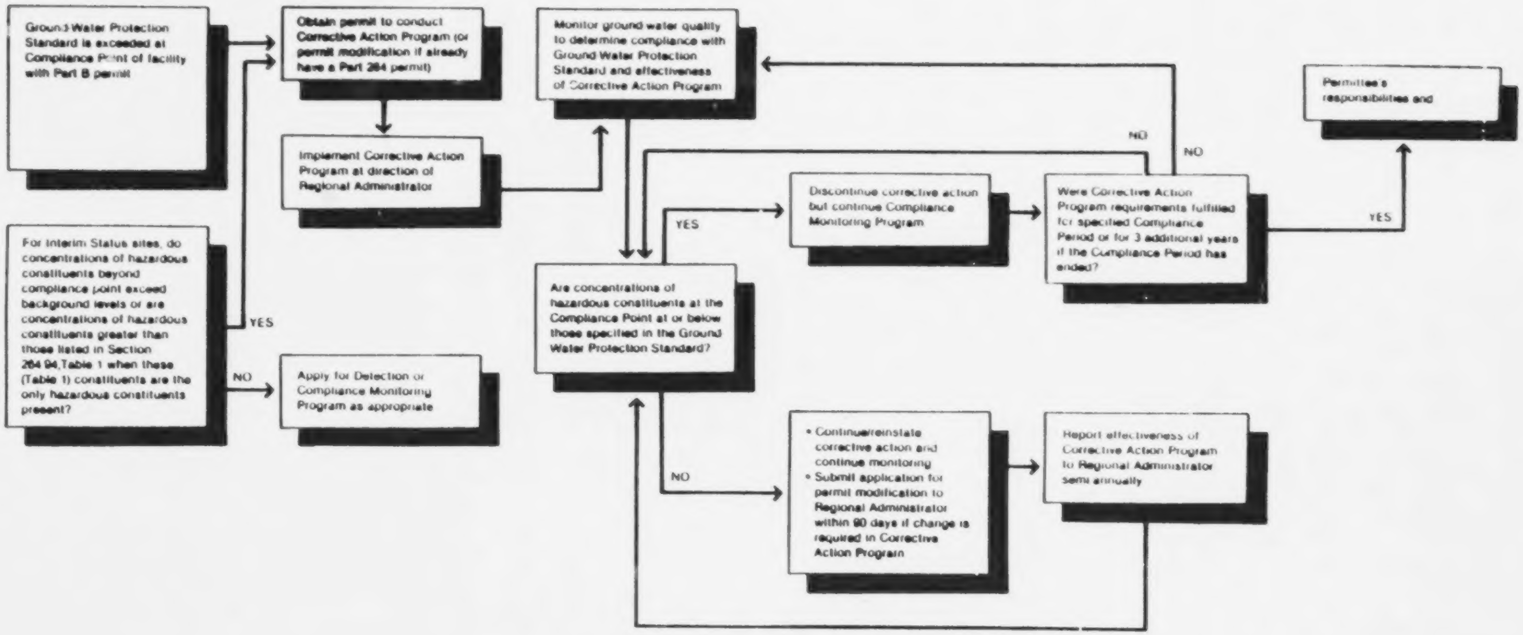
Ground-Water Protection Standard is exceeded at Compliance Point of facility with Part B permit
For Interim Status sites, do concentrations of hazardous constituents beyond compliance point exceed background levels or are concentrations of hazardous constituents greater than those listed in Section 264.94,Table 1 when these (Table 1) constituents are the only hazardous constituents present?
YES
NO
Obtain permit to conduct Corrective Action Program (or permit modification if already have a Part 264 permit)
Implement Corrective Action Program at direction of Regional Administrator
Apply for Detection or Compliance Monitoring Program as appropriate
Monitor ground water quality to determine compliance with Ground Water Protection Standard and effectiveness of Corrective Action Program
Are concentrations of hazardous constituents at the Compliance Point at or below those specified in the Ground Water Protection Standard?
YES
NO
Discontinue corrective action but continue Compliance Monitoring Program
• Continue/reinstate corrective action and continue monitoring
• Submit application for permit modification to Regional Administrator within 90 days if change is required in Corrective Action Program
Were Corrective Action Program requirements fulfilled for specified Compliance Period or for 3 additional years if the Compliance Period has ended?
NO
NO
YES
Report effectiveness of Corrective Action Program to Regional Administrator semi annually
Permittee's responsibilities end

Figure 9-9. Corrective action program requirements.

9.7.2.1 Objective of Corrective Action --

The general goal of corrective action is to achieve compliance with the Ground-Water Protection Standard. This goal must be achieved by removing the hazardous constituents, or by treating them in place. Methods that only prevent movement of hazardous constituents in the ground water for some period of time are not adequate. Such measures as slurry walls that only modify the ground-water gradient or create short-term barriers are not adequate corrective action methods by themselves. However, slurry walls combined with pumping wells used to extract contaminated ground water for treatment, and measures to control the source of hazardous constituents may be acceptable.

Corrective action measures are highly dependent on site-specific factors. In order to accommodate this situation, and in recognition of the likely technological advances in ground-water cleanup in the coming years, the Agency will rely on the broad performance goals in §264.100 to evaluate proposed corrective action programs.

9.8.2.2 Timing of Corrective Action --

The regulations establish that corrective action measures be installed within a reasonable time. The permit will specify the actual time limit within which the action must begin. When a permit combines both compliance monitoring and corrective action, the appropriate response to a statistically significant increase in hazardous constituents is the initiation of the already approved corrective action, rather than submission of a permit modification application (see §264.100(c)).

Corrective action must be performed as long as is necessary to achieve stable compliance with the Ground Water Protection Standard. Three consecutive years of compliance is recommended before terminating the corrective action program.

Corrective action must continue through the compliance period (see §264.96) to the extent necessary to meet the Ground-Water Protection Standard. The compliance period is extended if corrective action is still needed at the originally scheduled end of the compliance period.

9.8.2.3 Duty to Clean Up Contamination Beyond the Compliance Point --

At the time that EPA considers a regulated unit at an existing facility for permitting, it is possible that a plume of contamination will have already migrated from the unit to beyond the compliance point. As required by §264.100(e), the permittee will be required to clean up such a plume of hazardous constituents between the compliance point and the facility property boundary. If the owner or operator can show that the plume does not originate from a regulated unit, the permit would not require him to clean it up. The time frame criteria for this cleanup are the same as those explained in Section 9.8.2.2.

9.8.2.4 Corrective Action Monitoring --

The corrective action program must include a monitoring program that can show whether the corrective action has been successful. The monitoring program should be based at a minimum on the compliance monitoring program of §264.99 (see Section 9.7).

In some cases, it may be necessary to conduct more frequent monitoring or to have additional wells than in the compliance monitoring program, in order to evaluate the progress of the corrective action.

9.8.2.5 Reporting --

Permittees must report semi-annually on the effectiveness of the corrective action program to the Regional Administrator. This report will be used by EPA to ensure that the permittee does not simply continue to implement measures that are not achieving the Ground-Water Protection Standard.

9.8.3 Guidance to Address the Application Information Requirement

It is suggested that the applicant develop and present the proposed Corrective Action Program as a group of related, but distinct attachments to the application. These attachments should be identified one from the other, but all should be identified as part of the Corrective Action Program. For example, the attachments might be named CAP-1, CAP-2, CORR-1, CORR-2, etc. Suggested attachments include the following:

- Map of Corrective Action Monitoring Wells
- Plans and specifications for Corrective Action Monitoring Wells
- Sampling Techniques Including Flow Rate and Direction Determinations
- Sample Preservation and Shipping Procedures
- Sample Analysis Protocolsa
- Sample Chain of Custody Procedures
- Statistical Procedures Used to Evaluate Changes in Ground Water Parameters

- Characterization of Ground Water
- Proposed Hazardous Constituent Concentration Limits
- Plans and Specifications for Corrective Action Plan

9.8.3.1 Characterization of Contaminated Ground Water--

This information requirement is the same as that described in §270.14(c)(7)(ii) for a compliance monitoring program. The applicant should consult Section 9.7.3.2 for guidance. It is necessary to characterize the extent and concentration of contamination that has migrated beyond the point of compliance. This information is needed for the proper design and implementation of corrective actions. Guidance on characterization of such plumes beyond the compliance point is also provided in Section 9.5.

9.8.3.2 Proposed Hazardous Constituent Concentration Limits --

The applicant must propose a concentration limit for each hazardous constituent found in the ground water. The Regional Administrator will evaluate this proposal in establishing a Ground-Water Protection Standard. This requirement is the same as that described in Section 9.7.3.3.

After conducting site investigations necessary to design a corrective action program, the applicant may have new data useful in justifying alternate concentration limits in the Ground-Water Protection Standard. The applicant may wish to consider proposing a permit modification based on these new data.

9.8.3.3 Corrective Action Plan --

The applicant must submit detailed plans and an engineering report on the corrective actions proposed for the facility. This information should include:

- Maps and plans showing the location of engineered barriers, caps, drains and wells, etc. (use the §270.14(b)(19) base map);
- Descriptions and engineering drawings of construction details and specifications of engineered barriers, caps, drains, wells, etc.;
- If proposed, plans for removing and handling of any hazardous wastes;
- A description of the treatment technologies to be used for contaminated ground water that is pumped or drained from the zone of contamination;
- A prediction and sensitivity analysis on the effectiveness of corrective actions. For example, anticipated drain flow rates, assuming a range of hydrologic properties (Numerical simulation models of ground water flow and solute transport may be particularly useful);
- If treated ground or surface water is to be reinjected at the site, the concentration levels of all hazardous constituents to be reinjected;
- A description and summary of any additional hydrogeologic data collected for use in designing the corrective action;
- Operation and maintenance plans for the corrective action measures; and
- If applicable, closure and post-closure care plans for the materials used to handle hazardous wastes as part of the corrective action.

Guidance for designing and evaluating corrective action measures is available in the Handbook: Remedial Action at Waste Disposal Sites EPA-625/6-82-006, in Chapter 10 of Reference 1 and in the Guidance Manual for Minimizing Pollution from Waste Disposal Sites EPA-600/2-78-142, 1978, NTIS No. PB286905.

9.8.3.4 Ground-Water Monitoring --

The application must include a description of the ground-water monitoring program used to assess the effectiveness of the corrective action measures. This program will normally involve both water level and water quality monitoring. Water level monitoring is generally necessary to determine whether drains, barriers and wells are altering the ground-water flow field as intended. Water quality monitoring must be conducted over the on-site extent of the contaminated ground water.

The applicant must provide details on well location, construction, sampling frequency and methods, analysis methods, and chain of custody procedures. Further guidance on these topics is available in Section 9.6 and 9.7 of this Manual, and in Chapters 3 and 10 of the Permit Writer's Guidance Manual for Subpart F, Ground-Water Protection (Reference 1).

9.9 REFERENCES

1. U.S. Environmental Protection Agency. Permit Writers' Guidance Manual for Subpart F, Ground-Water Protection. Wahington, D.C., 1983.

2. Callahan, M.A., M.W. Slimak, N.W. Babe, I.P. May, and C.F. Fowler. Water-selected Environmental Fate of 129 Priority Pollutants. Volume 1. Introduction and Technical Background, Metals and Inorganics, Pesticides and PCBs. Final Report. EPA-440/4-79-029a, Versar, Inc., Springfield, Virginia, December 1979. NTIS No. PB80-204373.

3. Scalf, M.R., J.F. McNabb, W.J. Dunlap, R.L. Cosby, and J.S. Fryberger. Manuals of Ground-Water Quality Sampling Procedures. EPA-600/2-81-160, Robert S. Kerr Environmental Research Laboratory, Ada, Oklahoma, September 1981. NTIS No. PB82-103045.

APPENDIX A

RCRA PART A PERMIT APPLICATION FORMS AND INSTRUCTIONS

United States
Environmental Protection
Agency

Office of
Enforcement
Washington, DC 20460

EPA Form 3510-1
June 1980

Permits Division

EPA

Application Form 1 - General Information

Consolidated Permits Program

This form must be completed by all persons applying for a permit under EPA's Consolidated Permits Program. See the general instructions to Form 1 to determine which other application forms you will need.

1-1

DESCRIPTION OF CONSOLIDATED PERMIT APPLICATION FORMS

The Consolidated Permit Application Forms are:

Form 1 – General Information *(Included in this part)*;

Form 2 – Discharges to Surface Water *(NPDES Permits)*:

2A. Publicly Owned Treatment Works *(Reserved – not included in this package)*,

2B. Concentrated Animal Feeding Operations and Aquatic Animal Production Facilities *(not included in this package)*,

2C. Existing Manufacturing, Commercial, Mining, and Silvicultural Operations *(not included in this package)*, and

2D. New Manufacturing, Commercial, Mining, and Silvicultural Operations *(Reserved – not included in this package)*;

Form 3 – Hazardous Waste Application Form *(RCRA Permits – included in Part 2 of this package)*;

Form 4 – Underground Injection of Fluids *(UIC Permits – Reserved – not included in this package)*; and

Form 5 – Air Emissions in Attainment Areas *(PSD Permits – Reserved – not included in this package)*.

FORM 1 PACKAGE TABLE OF CONTENTS

Section A. General Instructions

Section B. Instructions for Form 1

Section C. Activities Which Do Not Require Permits

Section D. Glossary

Form 1 *(two copies)*

SECTION A – GENERAL INSTRUCTIONS

Who Must Apply

With the exceptions described in Section C of these instructions, Federal laws prohibit you from conducting any of the following activities without a permit.

NPDES *(National Pollutant Discharge Elimination System Under the Clean Water Act, 33 U.S.C. 1251)*. Discharge of pollutants into the waters of the United States.

RCRA *(Resource Conservation and Recovery Act, 42 U.S.C. 6901)*. Treatment, storage, or disposal of hazardous wastes.

UIC *(Underground Injection Control Under the Safe Drinking Water Act, 42 U.S.C. 300f)*. Injection of fluids underground by gravity flow or pumping.

PSD *(Prevention of Significant Deterioration Under the Clean Air Act, 72 U.S.C. 7401)*. Emission of an air pollutant by a new or modified facility in or near an area which has attained the National Ambient Air Quality Standards for that pollutant.

Each of the above permit programs is operated in any particular State by either the United States Environmental Protection Agency *(EPA)* or by an approved State agency. You must use this application form to apply for a permit for those programs administered by EPA. For those programs administered by approved States, contact the State environmental agency for the proper forms.

If you have any questions about whether you need a permit under any of the above programs, or if you need information as to whether a particular program is administered by EPA or a State agency, or if you need to obtain application forms, contact your EPA Regional office *(listed in Table 1)*.

Upon your request, and based upon information supplied by you, EPA will determine whether you are required to obtain a permit for a particular facility. Be sure to contact EPA if you have a question, because Federal laws provide that you may be heavily penalized if you do not apply for a permit when a permit is required.

Form 1 of the EPA consolidated application forms collects general information applying to all programs. You must fill out Form 1 regardless of which permit you are applying for. In addition, you must fill out one of the supplementary forms *(Forms 2 – 5)* for each permit needed under each of the above programs. Item II of Form 1 will guide you to the appropriate supplementary forms.

You should note that there are certain exclusions to the permit requirements listed above. The exclusions are described in detail in Section C of these instructions. If your activities are excluded from permit requirements then you do not need to complete and return any forms.

NOTE: Certain activities not listed above also are [illegible] EPA administered environmental permit requirements. These include permits for ocean dumping, dredged or fill material [illegible] certain types of air emissions. Contact your EPA [illegible] for further information.

Table 1. Addresses of EPA Regional Contacts and States Within the Regional Office Jurisdictions

REGION I

Permit Contact, Environmental and Economic Impact Office, U.S. Environmental Protection Agency, John F. Kennedy Building, Boston, Massachusetts 02203, (617) 223–4636, FTS 223–[illegible]
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

REGION II

Permit Contact, Permits Administration Branch, Room 432, U.S. Environmental Protection Agency, 26 Federal Plaza, New York, New York 10007, (212) 264–9880, FTS 264–9880.
New Jersey, New York, Virgin Islands, and Puerto Rico.

REGION III

Permit Contact *(3 EN 23)*, U.S. Environmental Protection Agency, 6th & Walnut Streets, Philadelphia, Pennsylvania 19106, (215) 597–8816, FTS 597–8816.
Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia.

REGION IV

Permit Contact, Permits Section, U.S. Environmental Protection Agency, 345 Courtland Street, N.E., Atlanta, Georgia 30365, (404) 881–2017, FTS 257–2017.
Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee.

REGION V

Permit Contact *(5EP)*, U.S. Environmental Protection Agency, 230 South Dearborn Street, Chicago, Illinois 60604, (312) 353–2105, FTS 353–2105.
Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin.

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Table 1 *(continued)*

REGION VI

Permit Contact *(6AEP)*, U.S. Environmental Protection Agency, First International Building, 1201 Elm Street, Dallas, Texas 75270, (214) 767–2765, FTS 729–2765.
Arkansas, Louisiana, New Mexico, Oklahoma, and Texas.

REGION VII

Permit Contact, Permits Branch, U.S. Environmental Protection Agency, 324 East 11th Street, Kansas City, Missouri 64106, (816) 758–5955, FTS 758–5955.
Iowa, Kansas, Missouri, and Nebraska.

REGION VIII

Permit Contact *(8E–WE)*, Suite 103, U.S. Environmental Protection Agency, 1816 Lincoln Street, Denver, Colorado 80203, (303) 837–4901, FTS 837–4901.
Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

REGION IX

Permit Contact, Permits Branch *(E–4)*, U.S. Environmental Protection Agency, 215 Fremont Street, San Francisco, California 94105, (415) 556–3450, FTS 556–3450.
Arizona, California, Hawaii, Nevada, Guam, American Samoa, and Trust Territories.

REGION X

Permit Contact *(M/S 521)*, U.S. Environmental Protection Agency, 1200 6th Avenue, Seattle, Washington 98101, (206) 442–7176, FTS 399–7176.
Alaska, Idaho, Oregon, and Washington.

Where to File

The application forms should be mailed to the EPA Regional office whose Region includes the State in which the facility is located *(see Table 1)*.

If the State in which the facility is located administers a Federal permit program under which you need a permit, you should contact the appropriate State agency for the correct forms. Your EPA Regional office *(Table 1)* can tell you to whom to apply and can provide the appropriate address and phone number.

When to File

Because of statutory requirements, the deadlines for filing applications vary according to the type of facility you operate and the type of permit you need. These deadlines are as follows:[1]

Table 2. Filing Dates for Permits

FORM*(permit)*	WHEN TO FILE
2A*(NPDES)*	180 days before your present NPDES permit expires.
2B*(NPDES)*	180 days before your present NPDES permit expires[2], or 180 days prior to start-up if you are a new facility.
2C*(NPDES)*	180 days before your present NPDES permit expires[2].
2D*(NPDES)*	180 days prior to startup.
3*(Hazardous Waste)*	Existing facility: Six months following publication of regulations listing hazardous wastes. New facility: 180 days before commencing physical construction.
4*(UIC)*	A reasonable time prior to construction for new wells; as directed by the Director for existing wells.
5*(PSD)*	Prior to commencement of construction.

[1] Please note that some of these forms are not yet available for use and are listed as "Reserved" at the beginning of these instructions. Contact your EPA Regional office for information on current application requirements and forms.

[2] If your present permit expires on or before November 30, 1980, the filing date is the date on which your permit expires. If your permit expires during the period December 1, 1980 – May 31, 1981, the filing date is 90 days before your permit expires.

Federal regulations provide that you may not begin to construct a new source in the NPDES program, a new hazardous waste management facility, a new injection well, or a facility covered by the PSD program before the issuance of a permit under the applicable program. Please note that if you are required to obtain a permit before beginning construction, as described above, you may need to submit your permit application well in advance of an applicable deadline listed in Table 2.

Fees

The U.S. EPA does not require a fee for applying for any permit under the consolidated permit programs. *(However, some States which administer one or more of these programs require fees for the permits which they issue.)*

Availability of Information to Public

Information contained in these application forms will, upon request, be made available to the public for inspection and copying. However, you may request confidential treatment for certain information which you submit on certain supplementary forms. The specific instructions for each supplementary form state what information on the form, if any, may be claimed as confidential and what procedures govern the claim. No information on Forms 1 and 2A through 2D may be claimed as confidential.

Completion of Forms

Unless otherwise specified in instructions to the forms, each item in each form must be answered. To indicate that each item has been considered, enter "NA," for not applicable, if a particular item does not fit the circumstances or characteristics of your facility or activity.

If you have previously submitted information to EPA or to an approved State agency which answers a question, you may either repeat the information in the space provided or attach a copy of the previous submission. Some items in the form require narrative explanation. If more space is necessary to answer a question, attach a separate sheet entitled "Additional Information."

Financial Assistance for Pollution Control

There are a number of direct loans, loan guarantees, and grants available to firms and communities for pollution control expenditures. These are provided by the Small Business Administration, the Economic Development Administration, the Farmers Home Administration, and the Department of Housing and Urban Development. Each EPA Regional office *(Table 1)* has an economic assistance coordinator who can provide you with additional information.

EPA's construction grants program under Title II of the Clean Water Act is an additional source of assistance to publicly owned treatment works. Contact your EPA Regional office for details.

This form must be completed by all applicants.

Completing This Form

Please type or print in the unshaded areas only. Some items have small graduation marks in the fill–*in* spaces. These marks indicate the number of characters that may be entered into our data system. The marks are spaced at 1/6" intervals which accommodate elite type *(12 characters per inch)*. If you use another type you may ignore the marks. If you print, place each character between the marks. Abbreviate if necessary to stay within the number of characters allowed for each item. Use one space for breaks between words, but not for punctuation marks unless they are needed to clarify your response.

Item I

Space is provided at the upper right hand corner of Form 1 for insertion of your EPA Identification Number. If you have an existing facility, enter your Identification Number. If you don't know your EPA Identification Number, please contact your EPA Regional office *(Table 1)*, which will provide you with your number. If your facility is new *(not yet constructed)*, leave this item blank.

Item II

Answer each question to determine which supplementary forms you need to fill out. Be sure to check the glossary in Section D of these instructions for the legal definitions of the **bold faced words**. Check Section C of these instructions to determine whether your activity is excluded from permit requirements.

If you answer "no" to every question, then you do not need a permit, and you do not need to complete and return any of these forms.

If you answer "yes" to any question, then you must complete and file the supplementary form by the deadline listed in Table 2 along with this form. *(The applicable form number follows each question and is enclosed in parentheses.)* You need not submit a supplementary form if you already have a permit under the appropriate Federal program, unless your permit is due to expire and you wish to renew your permit.

Questions (I) and (J) of Item II refer to major new or modified sources subject to Prevention of Significant Deterioration *(PSD)* requirements under the Clean Air Act. For the purpose of the PSD program, major sources are defined as: (A) Sources listed in Table 3 which have the potential to emit 100 tons or more per year emissions; and (B) All other sources with the potential to emit 250 tons or more per year. See Section C of these instructions for discussion of exclusions of certain modified sources.

Table 3. 28 Industrial Categories Listed in Section 169(1) of the Clean Air Act of 1977

Fossil fuel–fired steam generators of more than 250 million BTU per hour heat input;
Coal cleaning plants *(with thermal dryers)*;
Kraft pulp mills;
Portland cement plants;
Primary zinc smelters;
Iron and steel mill plants;
Primary aluminum ore reduction plants;
Primary copper smelters;
Municipal incinerators capable of charging more than 250 tons of refuse per day;
Hydrofluoric acid plants;
Nitric acid plants;
Sulfuric acid plants;
Petroleum refineries;
Lime plants;
Phosphate rock processing plants;
Coke oven batteries;
Sulfur recovery plants;
Carbon black plants *(furnace process)*;
Primary lead smelters;
Fuel conversion plants;
Sintering plants;
Secondary metal production plants;
Chemical process plants;
Fossil fuel boilers *(or combination thereof)* totaling more than 250 million BTU per hour heat input;

Table 3 *(continued)*

Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels;
Taconite ore processing plants;
Glass fiber processing plants; and
Charcoal production plants.

Item III

Enter the facility's official or legal name. Do not use a colloquial name.

Item IV

Give the name, title, and work telephone number of a person who is thoroughly familiar with the operation of the facility and with the facts reported in this application and who can be contacted by reviewing offices if necessary.

Item V

Give the complete mailing address of the office where correspondence should be sent. This often is not the address used to designate the location of the facility or activity.

Item VI

Give the address or location of the facility identified in Item III of this form. If the facility lacks a street name or route number, give the most accurate alternative geographic information *(e.g., section number or quarter section number from county records or at intersection of Rts. 425 and 22)*.

Item VII

List, in descending order of significance, the four [illegible] standard industrial classification *(SIC)* codes which best describe your facility in terms of the principal products or services you produce or provide. Also, specify each classification in words. These classifications may differ from the SIC codes describing the operation generating the discharge, air emissions, or hazardous wastes.

SIC code numbers are descriptions which may be found in the "Standard Industrial Classification Manual" prepared by the Executive Office of the President, Office of Management and Budget, which is available from the Government Printing Office, Washington, D.C. Use the current edition of the manual. If you have any questions concerning the appropriate SIC code for your facility, contact your EPA Regional office *(see Table 1)*.

Item VIII–A

Give the name, as it is legally referred to, of the person, firm, public organization, or any other entity which operates the facility described in this application. This may or may not be the same name as the facility. The operator of the facility is the legal entity which controls the facility's operation rather than the plant or site manager. Do not use a colloquial name.

Item VIII–B

Indicate whether the entity which operates the facility also owns it by marking the appropriate box.

Item VIII–C

Enter the appropriate letter to indicate the legal status of the operator of the facility. Indicate "public" for a facility solely owned by local government*(s)* such as a city, town, county, parish, etc.

Items VIII–D – H

Enter the telephone number and address of the operator identified in Item VIII–A.

Item IX

Indicate whether the facility is located on Indian Lands.

Item X

Give the number of each presently effective permit issued to the facility for each program or, if you have previously filed an application but have not yet received a permit, give the number of the application, if any. Fill in the unshaded area only. If you have more than one currently effective permit for your facility under a particular permit program, you may list additional permit numbers on a separate sheet of paper. List any relevant environmental Federal *(e.g., permits under the Ocean Dumping Act, Section 404 of the Clean Water Act or the Surface Mining Control and Reclamation Act)*, State *(e.g., State permits for new air emission sources in nonattainment areas under Part D of the Clean Air Act or State permits under Section 404 of the Clean Water Act)*, or local permits or applications under "other."

Item XI

Provide a topographic map or maps of the area extending at least to one mile beyond the property boundaries of the facility which clearly show the following:

The legal boundaries of the facility;

The location and serial number of each of your existing and proposed intake and discharge structures;

All hazardous waste management facilities;

Each well where you inject fluids underground; and

All springs and surface water bodies in the area, plus all drinking water wells within 1/4 mile of the facility which are identified in the public record or otherwise known to you.

If an intake or discharge structure, hazardous waste disposal site, or injection well associated with the facility is located more than one mile from the plant, include it on the map, if possible. If not, attach additional sheets describing the location of the structure, disposal site, or well, and identify the U.S. Geological Survey *(or other)* map corresponding to the location.

On each map, include the map scale, a meridian arrow showing north, and latitude and longitude at the nearest whole second. On all maps of rivers, show the direction of the current, and in tidal waters, show the directions of the ebb and flow tides. Use a 7-1/2 minute series map published by the U.S. Geological Survey, which may be obtained through the U.S. Geological Survey Offices listed below. If a 7-1/2 minute series map has not been published for your facility site, then you may use a 15 minute series map from the U.S. Geological Survey. If neither a 7-1/2 nor 15 minute series map has been published for your facility site, use a plat map or other appropriate map, including all the requested information; in this case, briefly describe land uses in the map area *(e.g., residential, commercial)*.

You may trace your map from a geological survey chart, or other map meeting the above specifications. If you do, your map should bear a note showing the number or title of the map or chart it was traced from. Include the names of nearby towns, water bodies, and other prominent points. An example of an acceptable location map is shown in Figure 1–1 of these instructions. *(NOTE: Figure 1–1 is provided for purposes of illustration only, and does not represent any actual facility.)*

U.S.G.S. OFFICES	AREA SERVED
Eastern Mapping Center National Cartographic Information Center U.S.G.S. 536 National Center Reston, Va. 22092 Phone No. (703) 860–6336	Ala., Conn., Del., D.C., Fla., Ga., Ind., Ky., Maine, Md., Mass., N.H., N.J., N.Y., N.C., S.C., Ohio, Pa., Puerto Rico, R.I., Tenn., Vt., Va., W. Va., and Virgin Islands.

Item XI *(continued)*

Mid Continent Mapping Center National Cartographic Information Center U.S.G.S. 1400 Independance Road Rolla, Mo. 65401 Phone No. (314) 341–0851	Ark., Ill., Iowa, Kans., Mich., Minn., Miss., Mo., N. Dak., Nebr., Okla., S. Dak., and Wis.
Rocky Mountain Mapping Center National Cartographic Infomation Center U.S.G.S. Stop 504, Box 25046 Federal Center Denver, Co. 80225 Phone No. (303) 234–2326	Alaska, Colo., Mont., N. Mex., Tex., Utah, and Wyo.
Western Mapping Center National Cartographic Information Center U.S.G.S. 345 Middlefield Road Menlo Park, Ca. 94025 Phone No. (415) 323–8111	Ariz., Calif., Hawaii, Idaho, Nev., Oreg., Wash., American Samoa, Guam, and Trust Territories

Item XII

Briefly describe the nature of your business *(e.g., products produced or services provided)*.

Item XIII

Federal statues provide for severe penalties for submitting false information on this application form.

18 U.S.C. Section 1001 provides that "Whoever, in any matter within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals or covers up by any trick, scheme, or device a material fact, or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than five years, or both."

Section 309(c)(2) of the Clean Water Act and Section 113(c)(2) of the Clean Air Act each provide that "Any person who knowingly makes any false statement, representation, or certification in any application, . . . shall upon conviction, be punished by a fine of no more than $10,000 or by imprisonment for not more than six months, or both."

In addition, Section 3008(d)(3) of the Resource Conservation and Recovery Act provides for a fine up to $25,000 per day or imprisonment up to one year, or both, for a first conviction for making a false statement in any application under the Act, and for double these penalties upon subsequent convictions.

FEDERAL REGULATIONS REQUIRE THIS APPLICATION TO BE SIGNED AS FOLLOWS:

A. For a corporation, by a principal executive officer of at least th level of vice president. However, if the only activity in Item II whic is marked "yes" is Question G, the officer may authorize a perso having responsibility for the overall operations of the well or wel field to sign the certification. In that case, the authorization must b written and submitted to the permitting authority.

B. For partnership or sole proprietorship, by a general partner or th proprietor, respectively; or

C. For a municipality, State, Federal, or other public facility, b either a principal executive officer or ranking elected official.

SECTION C – ACTIVITIES WHICH DO NOT REQUIRE PERMITS

I. National Pollutant Discharge Elimination System Permits Under the Clean Water Act. You are not required to obtain an NPDES permit if your discharge is in one of the following categories, as provided by the Clean Water Act *(CWA)* and by the NPDES regulations *(40 CFR Parts 122–125)*. However, under Section 510 of CWA a discharge exempted from the federal NPDES requirements may still be regulated by a State authority; contact your State environmental agency to determine whether you need a State permit.

A. DISCHARGES FROM VESSELS. Discharges of sewage from vessels, effluent from properly functioning marine engines, laundry, shower, and galley sink wastes, and any other discharge incidental to the normal operation of a vessel do not require NPDES permits. However, discharges of rubbish, trash, garbage, or other such materials discharged overboard require permits, and so do other discharges when the vessel is operating in a capacity other than as a means of transportation, such as when the vessel is being used as an energy or mining facility, a storage facility, or a seafood processing facility, or is secured to the bed of the ocean, contiguous zone, or waters of the United States for the purpose of mineral or oil exploration or development.

B. DREDGED OR FILL MATERIAL. Discharges of dredged or fill material into waters of the United States do not need NPDES permits if the dredging or filling is authorized by a permit issued by the U.S. Army Corps of Engineers or an EPA approved State under Section 404 of CWA.

C. DISCHARGES INTO PUBLICLY OWNED TREATMENT WORKS *(POTW)*. The introduction of sewage, industrial wastes, or other pollutants into a POTW does not need an NPDES permit. You must comply with all applicable pretreatment standards promulgated under Section 307(b) of CWA, which may be included in the permit issued to the POTW. If you have a plan or an agreement to switch to a POTW in the future, this does not relieve you of the obligation to apply for and receive an NPDES permit until you have stopped discharging pollutants into waters of the United States.

(NOTE: Dischargers into privately owned treatment works do not have to apply for or obtain NPDES permits except as otherwise required by the EPA Regional Administrator. The owner or operator of the treatment works itself, however, must apply for a permit and identify all users in its application. Users so identified will receive public notice of actions taken on the permit for the treatment works.)

D. DISCHARGES FROM AGRICULTURAL AND SILVICULTURAL ACTIVITIES. Most discharges from agricultural and silvicultural activities to waters of the United States do not require NPDES permits. These include runoff from orchards, cultivated crops, pastures, range lands, and forest lands. However, the discharges listed below do require NPDES permits. Definitions of the terms listed below are contained in the Glossary section of these instructions.

1. Discharges from Concentrated Animal Feeding Operations. *(See Glossary for definitions of "animal feeding operations" and "concentrated animal feeding operations." Only the latter require permits.)*

2. Discharges from Concentrated Aquatic Animal Production Facilities. *(See Glossary for size cutoffs.)*

3. Discharges associated with approved Aquaculture Projects.

4. Discharges from Silvicultural Point Sources. *(See Glossary for the definition of "silvicultural point source.")* Nonpoint source silvicultural activities are excluded from NPDES permit requirements. However, some of these activities, such as stream crossings for roads, may involve point source discharges of dredged or fill material which may require a Section 404 permit. See 33 CFR 209.120.

E. DISCHARGES IN COMPLIANCE WITH AN ON–SCENE COORDINATOR'S INSTRUCTIONS.

II. Hazardous Waste Permits Under the Resource Conservation and Recovery Act. You may be excluded from the requirement to obtain a permit under this program if you fall into one of the following categories:

Generators who accumulate their own hazardous waste on–site for less than 90 days as provided in 40 CFR 262.34;

Farmers who dispose of hazardous waste pesticide from their own use as provided in 40 CFR 262.51;

Certain persons treating, storing, or disposing of small quantities of hazardous waste as provided in 40 CFR 261.4 or 261.5; and

Owners and operators of totally enclosed treatment facilities as defined in 40 CFR 260.10.

Check with your Regional office for details. Please note that even if you are excluded from permit requirements, you may be required by Federal regulations to handle your waste in a particular manner.

III. Underground Injection Control Permits Under the Safe Drinking Water Act. You are not required to obtain a permit under this program if you:

Inject into existing wells used to enhance recovery of oil and gas or to store hydrocarbons *(note, however, that these underground injections are regulated by Federal rules)*; [illegible]

Inject into or above a stratum which [illegible] well bore, an underground source of drinking [illegible] *jection is the type identified in Item II-H, for* [illegible] *permit)*. However, you must notify EPA of your [illegible] certain required information on forms supplied [illegible] your operation may be phased [illegible] wastes or a hazardous waste management [illegible] or septic tanks to dispose of hazardous [illegible]

[illegible]

IV. Prevention of Significant Deterioration Permits Under the Clean Air Act. The PSD program applies to newly constructed or modified facilities *(both of which are referred to as "new sources")* which increase air emissions. The Clean Air Act Amendments [illegible] exempt small new sources of air emissions from the PSD review program. Any new source in an industrial category listed in Table 3 of these instructions whose potential to emit is less than 100 tons per year is not required to get a PSD permit. In addition, any new source in an industrial category not listed in Table 3 whose potential to emit is less than 250 tons per year is exempted from the PSD requirements.

Modified sources which increase their net emissions *(the difference between the total emission increases and total emission decreases at the source)* less than the significant amount set forth in EPA regulations are also exempt from PSD requirements. Contact your EPA Regional office *(Table 1)* for further information.

SECTION D – GLOSSARY

NOTE: This Glossary includes terms used in the instructions and in Forms 1, 2B, 2C, and 3. Additional terms will be included in the future when other forms are developed to reflect the requirements of other parts of the Consolidated Permits Program. If you have any questions concerning the meaning of any of these terms, please contact your EPA Regional office *(Table 1)*.

ALIQUOT means a sample of specified volume used to make up a total composite sample.

ANIMAL FEEDING OPERATION means a lot or facility *(other than an aquatic animal production facility)* where the following conditions are met:

A. Animals *(other than aquatic animals)* have been, are, or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12 month period; and

B. Crops, vegetation, forage growth, or post—harvest residues are not sustained in the normal growing season over any portion of the lot or facility.

Two or more animal feeding operations under common ownership are a single animal feeding operation if they adjoin each other or if they use a common area or system for the disposal of wastes.

ANIMAL UNIT means a unit of measurement for any animal feeding operation calculated by adding the following numbers: The number of slaughter and feeder cattle multiplied by 1.0; Plus the number of mature dairy cattle multiplied by 1.4; Plus the number of swine weighing over 25 kilograms *(approximately 55 pounds)* multiplied by 0.4; Plus the number of sheep multiplied by 0.1; Plus the number of horses multiplied by 2.0.

APPLICATION means the EPA standard national forms for applying for a permit, including any additions, revisions, or modifications to the forms; or forms approved by EPA for use in approved States, including any approved modifications or revisions. For RCRA, "application" also means "Application, Part B."

APPLICATION, PART A means that part of the Consolidated Permit Application forms which a RCRA permit applicant must complete to qualify for interim status under Section 3005(e) of RCRA and for consideration for a permit. Part A consists of Form 1 *(General Information)* and Form 3 *(Hazardous Waste Application Form)*.

APPLICATION, PART B means that part of the application which a RCRA permit applicant must complete to be issued a permit. *(NOTE: EPA is not developing a specific form for Part B of the permit application, but an instruction booklet explaining what information must be supplied is available from the EPA Regional office.)*

APPROVED PROGRAM or **APPROVED STATE** means a State program which has been approved or authorized by EPA under 40 CFR Part 123.

AQUACULTURE PROJECT means a defined managed water area which uses discharges of pollutants into that designated area for the maintenance or production of harvestable freshwater, estuarine, or marine plants or animals. "Designated area" means the portions of the waters of the United States within which the applicant plans to confine the cultivated species, using a method of plan or operation *(including, but not limited to, physical confinement)* which, on the basis of reliable scientific evidence, is expected to ensure the specific individual organisms comprising an aquaculture crop will enjoy increased growth attributable to the discharge of pollutants and be harvested within a defined geographic area.

AQUIFER means a geological formation, group of formations, or part of a formation that is capable of yielding a significant amount of water to a well or spring.

AREA OF REVIEW means the area surrounding an injection well which is described according to the criteria set forth in 40 CFR Section 146.06.

AREA PERMIT means a UIC permit applicable to all or certain wells within a geographic area, rather than to a specified well, under 40 CFR Section 122.37.

ATTAINMENT AREA means, for any air pollutant, an area which has been designated under Section 107 of the Clean Air Act as having ambient air quality levels better than any national primary or secondary ambient air quality standard for that pollutant. Standards have been set for sulfur oxides, particulate matter, nitrogen dioxide, carbon monoxide, ozone, lead, and hydrocarbons. For purposes of the Glossary, "attainment area" also refers to "unclassifiable area," which means, for any pollutants, an area designated under Section 107 as unclassifiable with respect to that pollutant due to insufficient information.

BEST MANAGEMENT PRACTICES *(BMP)* means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMP's include treatment requirements, operation procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

BIOLOGICAL MONITORING TEST means any test which includes the use of aquatic algal, invertebrate, or vertebrate species to measure acute or chronic toxicity, and any biological or chemical measure of bioaccumulation.

BYPASS means the intentional diversion of wastes from any portion of a treatment facility.

CONCENTRATED ANIMAL FEEDING OPERATION means an animal feeding operation which meets the criteria set forth in either (A) or (B) below or which the Director designates as such on a case—by—case basis:

A. More than the numbers of animals specified in any of the following categories are confined:

1. 1,000 slaughter or feeder cattle,
2. 700 mature dairy cattle *(whether milked or dry cows)*,
3. 2,500 swine each weighing over 25 kilograms *(approximately 55 pounds)*,
4. 500 horses,
5. 10,000 sheep or lambs,
6. 55,000 turkeys,
7. 100,000 laying hens or broilers *(if the facility has a continuous overflow watering)*,
8. 30,000 laying hens or broilers *(if the facility has a liquid manure handling system)*,
9. 5,000 ducks, or
10. 1,000 animal units; or

B. More than the following numbers and types of animals are confined:

1. 300 slaughter or feeder cattle,
2. 200 mature dairy cattle *(whether milked or dry cows)*,
3. 750 swine each weighing over 25 kilograms *(approximately 55 pounds)*,
4. 150 horses,

CONCENTRATED ANIMAL FEEDING OPERATION ***(continued)***

5. 3,000 sheep or lambs,

6. 16,500 turkeys,

7. 30,000 laying hens or broilers *(if the facility has continuous overflow watering),*

8. 9,000 laying hens or broilers *(if the facility has a liquid manure handling system),*

9. 1,500 ducks, or

10. 300 animal units; AND

Either one of the following conditions are met: Pollutants are discharged into waters of the United States through a manmade ditch, flushing system or other similar manmade device *("manmade" means constructed by man and used for the purpose of transporting wastes)*; or Pollutants are discharged directly into waters of the United States which originate outside of and pass over, across, or through the facility or otherwise come into direct contact with the animals confined in the operation.

Provided, however, that no animal feeding operation is a concentrated animal feeding operation as defined above if such animal feeding operation discharges only in the event of a 25 year, 24 hour storm event.

CONCENTRATED AQUATIC ANIMAL PRODUCTION FACILITY means a hatchery, fish farm, or other facility which contains, grows or holds aquatic animals in either of the following categories, or which the Director designates as such on a case–by–case basis:

A. Cold water fish species or other cold water aquatic animals including, but not limited to, the Salmonidae family of fish *(e.g., trout and salmon)* in ponds, raceways or other similar structures which discharge at least 30 days per year but does not include:

1. Facilities which produce less than 9,090 harvest weight kilograms *(approximately 20,000 pounds)* of aquatic animals per year; and

2. Facilities which feed less than 2,272 kilograms *(approximately 5,000 pounds)* of food during the calendar month of maximum feeding.

B. Warm water fish species or other warm water aquatic animals including, but not limited to, the Ameiuridae, Cetrarchidae, and Cyprinidae families of fish *(e.g., respectively, catfish, sunfish, and minnows)* in ponds, raceways, or other similar structures which discharge at least 30 days per year, but does not include:

1. Closed ponds which discharge only during periods of excess runoff; or

2. Facilities which produce less than 45,454 harvest weight kilograms *(approximately 100,000 pounds)* of aquatic animals per year.

CONTACT COOLING WATER means water used to reduce temperature which comes into contact with a raw material, intermediate product, waste product other than heat, or finished product.

CONTAINER means any portable device in which a material is stored, transported, treated, disposed of, or otherwise handled.

CONTIGUOUS ZONE means the entire zone established by the United States under article 24 of the convention of the Territorial Sea and the Contiguous Zone.

CWA means the Clean Water Act *(formerly referred to the Federal Water Pollution Control Act)* Pub. L. 92–500, as amended by Pub. L. 95–217 and Pub. L. 95–576, 33 U.S.C. 1251 *et seq.*

DIKE means any embankment or ridge of either natural or manmade materials used to prevent the movement of liquids, sludges, solids, or other materials.

DIRECT DISCHARGE means the discharge of a pollutant as defined below.

DIRECTOR means the EPA Regional Administrator or the State Director as the context requires.

DISCHARGE ***(OF A POLLUTANT)*** means:

A. Any addition of any pollutant or combination of pollutants to waters of the United States from any point source; or

B. Any addition of any pollutant or combination of pollutants to the waters of the contiguous zone or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation.

This definition includes discharges into waters of the United States from: Surface runoff which is collected or channelled by man; Discharges through pipes, sewers, or other conveyances owned by a State, municipality, or other person which do not lead to POTW's; and Discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works. This term does not include an addition of pollutants by any indirect discharger.

DISPOSAL ***(in the RCRA program)*** means the discharge, deposit, injection, dumping, spilling, leaking, or placing of any hazardous waste into or on any land or water so that the hazardous waste or any constituent of it may enter the environment or be emitted into the air or discharged into any waters, including ground water.

DISPOSAL FACILITY means a facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which hazardous waste will remain after closure.

EFFLUENT LIMITATION means any restriction imposed by the Director on quantities, discharge rates, and concentrations of pollutants which are discharged from point sources into waters of the United States, the waters of the contiguous zone [illegible]

EFFLUENT LIMITATION GUIDELINE means a [illegible] by the Administrator under Section 304(b) of the [illegible] adopt or revise effluent limitations.

ENVIRONMENTAL PROTECTION AGENCY ***(EPA)*** means the United States Environmental Protection Agency.

EPA IDENTIFICATION NUMBER means the number assigned by EPA to each generator, transporter, and facility.

EXEMPTED AQUIFER means an aquifer or its portion that meets the criteria in the definition of USDW, but which has been exempted according to the procedures in 40 CFR Section 122.35(b).

EXISTING HWM FACILITY means a Hazardous Waste Management facility which was in operation, or for which construction had commenced, on or before October 21, 1976. Construction had commenced if (A) the owner or operator had obtained all necessary Federal, State, and local preconstruction approvals or permits, and either (B1) a continuous on–site, physical construction program had begun, or (B2) the owner or operator had entered into contractual obligations, which could not be cancelled or modified without substantial loss, for construction of the facility to be completed within a reasonable time.

(NOTE: This definition reflects the literal language of the statute. However, EPA believes that amendments to RCRA now in conference will shortly be enacted and will change the date for determining when a facility is an "existing facility" to one no earlier than May of 1980; indications are the conferees are considering October 30, 1980. Accordingly, EPA encourages every owner or operator of a facility which was built or under construction as of the promulgation date of the RCRA program regulations to file Part A of its permit application so that it can be quickly processed for interim status when the change in the law takes effect. When those amendments are enacted, EPA will amend this definition.)

EXISTING SOURCE or **EXISTING DISCHARGER** ***(in the NPDES program)*** means any source which is not a new source or a new discharger.

EXISTING INJECTION WELL means an injection well other than a new injection well.

FACILITY means any HWM facility, UIC underground injection well, NPDES point source, PSD stationary source, or any other facility or activity *(including land or appurtenances thereto)* that is subject to regulation under the RCRA, UIC, NPDES, or PSD programs.

FLUID means material or substance which flows or moves whether in a semisolid, liquid, sludge, gas, or any other form or state.

GENERATOR means any person by site, whose act or process produces hazardous waste identified or listed in 40 CFR Part 261.

GROUNDWATER means water below the land surface in a zone of saturation.

HAZARDOUS SUBSTANCE means any of the substances designated under 40 CFR Part 116 pursuant to Section 311 of CWA. *(NOTE: These substances are listed in Table 2c—4 of the instructions to Form 2C.)*

HAZARDOUS WASTE means a hazardous waste as defined in 40 CFR Section 261.3 published May 19, 1980.

HAZARDOUS WASTE MANAGEMENT FACILITY *(HWM facility)* means all contiguous land, structures, appurtenances, and improvements on the land, used for treating, storing, or disposing of hazardous wastes. A facility may consist of several treatment, storage, or disposal operational units *(for example, one or more landfills, surface impoundments, or combinations of them).*

IN OPERATION means a facility which is treating, storing, or disposing of hazardous waste.

INCINERATOR *(in the RCRA program)* means an enclosed device using controlled flame combustion, the primary purpose of which is to thermally break down hazardous waste. Examples of incinerators are rotary kiln, fluidized bed, and liquid injection incinerators.

INDIRECT DISCHARGER means a nondomestic discharger introducing pollutants to a publicly owned treatment works.

INJECTION WELL means a well into which fluids are being injected.

INTERIM AUTHORIZATION means approval by EPA of a State hazardous waste program which has met the requirements of Section 3006(c) of RCRA and applicable requirements of 40 CFR Part 123, Subparts A, B, and F.

LANDFILL means a disposal facility or part of a facility where hazardous waste is placed in or on land and which is not a land treatment facility, a surface impoundment, or an injection well.

LAND TREATMENT FACILITY *(in the RCRA program)* means a facility or part of a facility at which hazardous waste is applied onto or incorporated into the soil surface; such facilities are disposal facilities if the waste will remain after closure.

LISTED STATE means a State listed by the Administrator under Section 1422 of SDWA as needing a State UIC program.

MGD means millions of gallons per day.

MUNICIPALITY means a city, village, town, borough, county, parish, district, association, or other public body created by or under State law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under Section 208 of CWA.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)* means the national program for issuing modifying, revoking and reissuing, terminating, monitoring, and enforcing permits and imposing and enforcing pretreatment requirements, under Sections 307, 318, 402, and 405 of CWA. The term includes an approved program.

NEW DISCHARGER means any building, structure, facility, or installation: (A) From which there is or may be a new or additional discharge of pollutants at a site at which on October 18, 1972, it had never discharged pollutants; (B) Which has never received a finally effective NPDES permit for discharges at that site; and (C) Which is not a "new source." This definition includes an indirect discharger which commences discharging into waters of the United States. It also includes any existing mobile point source, such as an offshore oil drilling rig, seafood processing vessel, or aggregate plant that begins discharging at a location for which it does not have an existing permit.

NEW HWM FACILITY means a Hazardous Waste Management facility which began operation or for which construction commenced after October 21, 1976.

NEW INJECTION WELL means a well which begins injection after a UIC program for the State in which the well is located is approved.

NEW SOURCE *(in the NPDES program)* means any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced:

A. After promulgation of standards of performance under Section 306 of CWA which are applicable to such source; or

B. After proposal of standards of performance in accordance with Section 306 of CWA which are applicable to such [illegible] but only if the standards are promulgated in accordance with [illegible] 306 within 120 days of their proposal.

NON—CONTACT COOLING WATER means water used to reduc temperature which does not come into direct contact with any ra material, intermediate product, waste product *(other than heat)*, o finished product.

OFF—SITE means any site which is not "on—site."

ON—SITE means on the same or geographically contiguous propert which may be divided by public or private right*(s)*—of—way, provide the entrance and exit between the properties is at a cross—roads inte section, and access is by crossing as opposed to going along, th right*(s)*—of—way. Non—contiguous properties owned by the same pe son, but connected by a right- of—way which the person controls an to which the public does not have access, is also considered on—si property.

OPEN BURNING means the combustion of any material without th following characteristics:

A. Control of combustion air to maintain adequate temperature f efficient combustion;

B. Containment of the combustion—reaction in an enclosed devi to provide sufficient residence time and mixing for complete co bustion; and

C. Control of emission of the gaseous combustion products.

(See also "incinerator" and "thermal treatment").

OPERATOR means the person responsible for the overall operati of a facility.

OUTFALL means a point source.

OWNER means the person who owns a facility or part of a facil

PERMIT means an authorization, license, or equivalent control document issued by EPA or an approved State to implement the requirements of 40 CFR Parts 122, 123, and 124.

PHYSICAL CONSTRUCTION *(in the RCRA program)* means excavation, movement of earth, erection of forms or structures, or similar activity to prepare a HWM facility to accept hazardous waste.

PILE means any noncontainerized accumulation of solid, nonflowing hazardous waste that is used for treatment or storage.

POINT SOURCE means any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture.

POLLUTANT means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical waste, biological materials, radioactive materials *(except those regulated under the Atomic Energy Act of 1954, as amended [42 U.S.C. Section 2011 et seq.])*, heat, wrecked or discarded equipment, rocks, sand, cellar dirt and industrial, municipal, and agriculture waste discharged into water. It does not mean:

A. Sewage from vessels; or

B. Water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well used either to facilitate production or for disposal purposes is approved by authority of the State in which the well is located, and if the State determines that the injection or disposal will not result in the degradation of ground or surface water resources.

(NOTE: Radioactive materials covered by the Atomic Energy Act are those encompassed in its definition of source, byproduct, or special nuclear materials. Examples of materials not covered include radium and accelerator produced isotopes. See Train v. Colorado Public Interest Research Group, Inc., 426 U.S. 1 [1976].)

PREVENTION OF SIGNIFICANT DETERIORATION *(PSD)* means the national permitting program under 40 CFR 52.21 to prevent emissions of certain pollutants regulated under the Clean Air Act from significantly deteriorating air quality in attainment areas.

PRIMARY INDUSTRY CATEGORY means any industry category listed in the NRDC Settlement Agreement *(Natural Resources Defense Council v. Train, 8 ERC 2120 [D.D.C. 1976], modified 12 ERC 1833 [D.D.C. 1979])*.

PRIVATELY OWNED TREATMENT WORKS means any device or system which is: (A) Used to treat wastes from any facility whose operator is not the operator of the treatment works; and (B) Not a POTW.

PROCESS WASTEWATER means any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.

PUBLICLY OWNED TREATMENT WORKS or **POTW** means any device or system used in the treatment *(including recycling and reclamation)* of municipal sewage or industrial wastes of a liquid nature which is owned by a State or municipality. This definition includes any sewers, pipes, or other conveyances only if they convey wastewater to a POTW providing treatment.

RENT means use of another's property in return for regular payment.

RCRA means the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976 *(Pub. L. 94–580, as amended by Pub. L. 95–609, 42 U.S.C. Section 6901 et seq.)*.

ROCK CRUSHING AND GRAVEL WASHING FACILITIES are facilities which process crushed and broken stone, gravel, and riprap *(see 40 CFR Part 436, Subpart B, and the effluent limitations guidelines for these facilities)*.

SDWA means the Safe Drinking Water Act *(Pub. L. 95–523, as amended by Pub. L. 95–1900, 42 U.S.C. Section 300(f) et seq.)*.

SECONDARY INDUSTRY CATEGORY means any industry category which is not a primary industry category.

SEWAGE FROM VESSELS means human body wastes and the wastes from tiolets and other receptacles intended to receive or retain body wastes that are discharged from vessels and regulated under Section 312 of CWA, except that with respect to commercial vessels on the Great Lakes this term includes graywater. For the purposes of this definition, "graywater" means galley, bath, and shower water.

SEWAGE SLUDGE means the solids, residues, and precipitate separated from or created in sewage by the unit processes of a POTW. "Sewage" as used in this definition means any wastes, including wastes from humans, households, commercial establishments, industries, and storm water runoff, that are discharged to or otherwise enter a publicly owned treatment works.

SILVICULTURAL POINT SOURCE means any discernible, confined, and discrete conveyance related to rock crushing, gravel washing, log sorting, or log storage facilities which are operated in connection with silvicultural activities and from which pollutants are discharged into waters of the United States. This term does not [illegible] nonpoint source silvicultural activities such as nursery operations, [illegible] preparation, reforestation and subsequent cultural treatment, [illegible] prescribed burning, pest and fire control, harvesting [illegible] drainage, or road construction and maintenance [illegible] natural runoff. However, some of these activities *[illegible] ing for roads)* may involve point source discharges [illegible] material which may require a CWA Section 404 [illegible] and log storage facilities" are facilities whose [illegible] the holding of unprocessed wood, e.g., logs or [illegible] bark or after removal of bark in self-contained bodies of water *(mill ponds or log ponds)* or stored on land where water is applied intentionally on the logs *(wet decking)*. *(See 40 CFR Part 429, Subpart J, and the effluent limitations guidelines for these facilities.)*

STATE means any of the 50 States, the District of Columbia, Guam, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, the Trust Territory of the Pacific Islands *(except in the case of RCRA)*, and the Commonwealth of the Northern Mariana Islands *(except in the case of CWA)*.

STATIONARY SOURCE *(in the PSD program)* means any building, structure, facility, or installation which emits or may emit any air pollutant regulated under the Clean Air Act. "Building, structure, facility, or installation" means any grouping of pollutant–emitting activities which are located on one or more contiguous or adjacent properties and which are owned or operated by the same person *(or by persons under common control)*.

STORAGE *(in the RCRA program)* means the holding of hazardous waste for a temporary period at the end of which the hazardous waste is treated, disposed, or stored elsewhere.

STORM WATER RUNOFF means water discharged as a result of rain, snow, or other precipitation.

SURFACE IMPOUNDMENT or **IMPOUNDMENT** means a facility or part of a facility which is a natural topographic depression, manmade excavation, or diked area formed primarily of earthen materials *(although it may be lined with manmade materials)*, which is designed to hold an accumulation of liquid wastes or wastes containing free liquids and which is not an injection well. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons

TANK *(in the RCRA program)* means a stationary device, designed to contain an accumulation of hazardous waste which is constructed primarily of non–earthen materials *(e.g., wood, concrete, steel, plastic*, which provide structural support.

THERMAL TREATMENT *(in the RCRA program)* means the treatment of hazardous waste in a device which uses elevated temperature as the primary means to change the chemical, physical, or biological character or composition of the hazardous waste. Examples of thermal treatment processes are incineration, molten salt, pyrolysis, calcination, wet air oxidation, and microwave discharge. *(See also "Incinerator" and "open burning").*

TOTALLY ENCLOSED TREATMENT FACILITY *(in the RCRA program)* means a facility for the treatment of hazardous waste which is directly connected to an industrial production process and which is constructed and operated in a manner which prevents the release of any hazardous waste or any constituent thereof into the environment during treatment. An example is a pipe in which waste acid is neutralized.

TOXIC POLLUTANT means any pollutant listed as toxic under Section 307(a)(1) of CWA.

TRANSPORTER *(in the RCRA program)* means a person engaged in the off–site transportation of hazardous waste by air, rail, highway, or water.

TREATMENT *(in the RCRA program)* means any method, technique, or process, including neutralization, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such waste, or so as to recover energy or material resources from the waste, or so as to render such waste non–hazardous, or less hazardous; safer to transport, store, or dispose of; or amenable for recovery, amenable for storage, or reduced in volume.

UNDERGROUND INJECTION means well injection.

UNDERGROUND SOURCE OF DRINKING WATER or **USDW** means an aquifer or its portion which is not an exempted aquifer and:

A. Which supplies drinking water for human consumption; or

B. In which the ground water contains fewer than 10,000 mg/l total dissolved solids.

UPSET means an exceptional incident in which there is unintentional and temporary noncompliance with technology–based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

WATERS OF THE UNITED STATES means:

A. All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

B. All interstate waters, including interstate wetlands;

C. All other waters such as intrastate lakes, rivers, streams *(includin intermittent streams)*, mudflats, sandflats, wetlands, sloughs, prairi potholes, wet meadows, playa lakes, and natural ponds, the us degradation, or destruction of which would or could affect interstat or foreign commerce including any such waters:

1. Which are or could be used by interstate or foreign travelers f recreational or other purposes,

2. From which fish or shellfish are or could be taken and sold interstate or foreign commerce,

3. Which are used or could be used for industrial purposes by i dustries in interstate commerce;

D. All impoundments of waters otherwise defined as waters of th United States under this definition;

E. Tributaries of waters identified in paragraphs (A) – (D) abov

F. The territorial sea; and

G. Wetlands adjacent to waters *(other than waters that are themselv wetlands)* identified in paragraphs (A) – (F) of this definition.

Waste treatment systems, including treatment pon[illegible] desi ed to meet requirement of CWA *(other than [illegible] as defi in 40 CFR Section 423.11(m) which also mee[illegible] of t definition)* are not waters of the United States. [illegible] only to manmade bodies of water which neither [illegible] in waters of the United States *(such as a [illegible])* resulted from the impoundments of waters [illegible]

WELL INJECTION or **UNDERGROUND INJECTION** means the s surface emplacement of fluids through a bored, drilled, or driven w or through a dug well, where the depth of the dug well is greater th the largest surface dimension.

WETLANDS means those areas that are inundated or saturated surface or groundwater at a frequency and duration sufficient to s port, and that under normal circumstances do support, a prevalenc vegetation typically adapted for life in saturated soil conditions. W lands generally include swamps, marshes, bogs, and similar ar

Please print or type in the unshaded areas only
(fill-in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-R0175

FORM 1 GENERAL

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

F | | D

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill—in area below. Also, if any of the preprinted data is absent (*the area to the left of the label space lists the information that should appear*), please provide it in the proper fill—in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI (*except VI-B which must be completed regardless*). Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold—faced terms.

SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED	SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED
A. Is this facility a **publicly owned treatment works** which results in a discharge to **waters of the U.S.**? (FORM 2A)				B. Does or will this facility (*either existing or proposed*) include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a discharge to **waters of the U.S.**? (FORM 2B)			
C. Is this a facility which currently results in **discharges** to **waters of the U.S.** other than those described in A or B above? (FORM 2C)				D. Is this a proposed facility (*other than those described in A or B above*) which will result in a discharge [illegible] **waters of the U.S.**? (FORM 2D) [illegible]			
E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3)				F. Do you or will you inject at this facility [illegible] municipal effluent below the lowermost [illegible] taining, within one quarter mile of the [illegible] underground sources of drinking water? [illegible]			
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)				H. Do you or will you inject at this facility [illegible] cial processes such as mining of sulfur by the [illegible] process, solution mining of minerals, in situ [illegible] tion of fossil fuel, or [illegible] (FORM 4)			
I. Is this facility a proposed **stationary source** which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)				J. Is this facility a proposed **stationary source** [illegible] NOT one of the 28 industrial categories listed in the [illegible] instructions and which will potentially emit [illegible] per year of any air pollutant regulated under the C[illegible] Air Act and may affect or be located in an **attainment area**? (FORM 5)			

III. NAME OF FACILITY

1 SKIP

IV. FACILITY CONTACT

A. NAME & TITLE (*last, first, & title*)

B. PHONE (*area code & no.*)

2

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3

B. CITY OR TOWN

C. STATE

D. ZIP CODE

4

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5

B. COUNTY NAME

C. CITY OR TOWN

D. STATE

E. ZIP CODE

6

EPA Form 3510-1 (6-80)

CONTINUE ON REVERS

1-11

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CONTINUED FROM THE FRONT

VII. SIC CODES (4-digit, in order of priority)

A. FIRST
7 (specify)

B. SECOND
7 (specify)

C. THIRD
7 (specify)

D. FOURTH
7 (specify)

VIII. OPERATOR INFORMATION

A. NAME
8

B. Is the name listed in Item VIII-A also the owner?
☐ YES ☐ NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)
F = FEDERAL
S = STATE
P = PRIVATE
M = PUBLIC (other than federal or state)
O = OTHER (specify)
(specify)

D. PHONE (area code & no.)
A

E. STREET OR P.O. BOX

F. CITY OR TOWN
8

G. STATE

H. ZIP CODE

IX. INDIAN LAND

Is the facility located on Indian lands?
☐ YES ☐ NO

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharges to Surface Water)
9 N

B. UIC (Underground Injection of Fluids)
9 U

C. RCRA (Hazardous Wastes)
9 R

D. PSD (Air Emissions from Proposed Sources)
9 P

E. OTHER (specify)
9
(specify)

E. OTHER (specify)
9
(specify)

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. the outline of the facility, the location of each of its existing and proposed intake and discharge structures, treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS (provide a brief description)

XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)

B. SIGNATURE

C. DATE SIGNED

COMMENTS FOR OFFICIAL USE ONLY
C

EPA Form 3510-1 (6-80) REVERSE

1-12

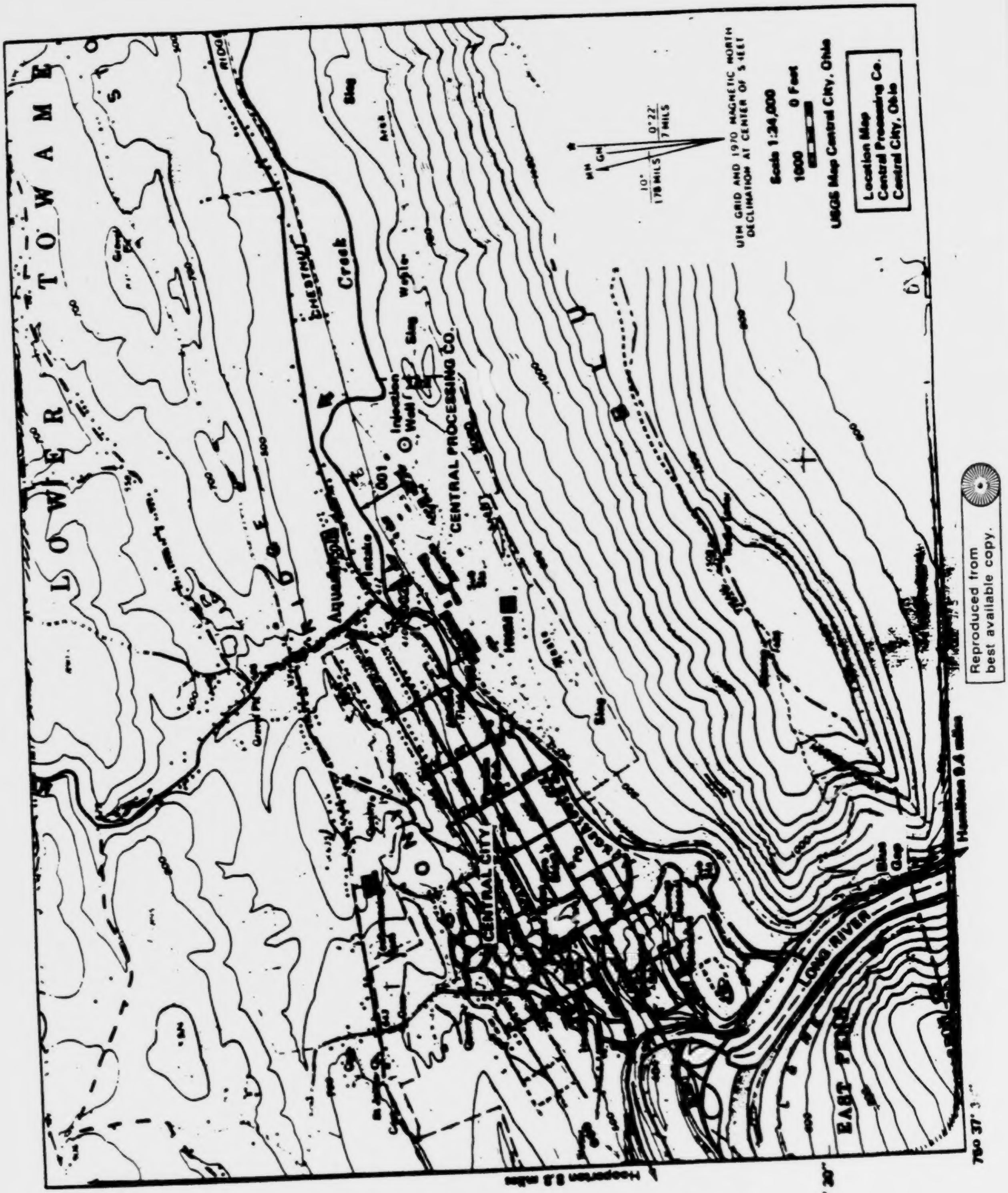
LOWER TOWAME
CHESTNUT RIDGE
Creek
Aquashicola
Intake
001
Injection Well
Slag
Waste
Slag Area
CENTRAL PROCESSING CO.
Hotel
CENTRAL CITY
LONG RIVER
EAST PENN
Blue Gap
Hamilton 9.4 miles
Hooperton 8.8 miles
40° 47' 30"
75° 37' 3
MN
GN
10°
178 MILS
0°22'
7 MILS
UTM GRID AND 1970 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET
Scale 1:24,000
1000
0 Feet
USGS Map Central City, Ohio
Location Map
Central Processing Co.
Central City, Ohio

FIGURE 1-1

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United States
Environmental Protection
Agency

Office of Water and
Hazardous Waste
Washington, DC 20460

EPA Form 3510-3
June 1980

Solid Waste

Application Form 3 - Hazardous Waste Information

Consolidated Permits Program

This form must be completed by all persons applying for an EPA hazardous waste permit.

FORM 3 – GENERAL INFORMATION

This form must be completed by all applicants who check "yes" to Item II–E in Form 1.

Permit Application Process

There are two parts to a RCRA permit application – Part A and Part B. Part A consists of this form and Form 1 of the Consolidated Permit Application. Part B requires detailed site–specific information such as geologic, hydrologic, and engineering data. 40 CFR 122.25 specifies the information that will be required from hazardous waste management facilities in Part B.

RCRA established a procedure for obtaining "interim status" which allows existing hazardous waste management facilities to continue their operations until a final hazardous waste permit is issued. In order to qualify for interim status, existing hazardous waste management facilities must submit Part A of the permit application to EPA within six months after the promulgation of regulations under Section 3001 of RCRA *(40 CFR Part 261)*. In order to receive a hazardous waste permit, existing facilities must submit a complete Part B within six months after it is requested by EPA. New facilities must submit both Part A and Part B to EPA at least 180 days before physical construction is expected to commence.

Operation During Interim Status

As provided in 40 CFR 122.23(b), Part A of the permit application defines the processes to be used for treatment, storage, and disposal of hazardous wastes; the design capacity of such processes; and the specific hazardous wastes to be handled at a facility during the interim status period. Once Part A is submitted to EPA, changes in the hazardous wastes handled, changes in design capacities, changes in processes, and changes in ownership or operational control at a facility during the interim status period may only be made in accordance with the procedures in 40 CFR 122.23(c). Changes in design capacity and changes in processes require prior EPA approval. Changes in the quantity of waste handled at a facility during interim status can be made without submitting a revised Part A provided the quantity does not exceed the design capacities of the processes specified in Part A of the permit application. Failure to furnish all information required to process a permit application is grounds for termination of interim status.

Confidential Information

All information submitted in this form will be subject to public disclosure, to the extent provided by RCRA and the Freedom of Information Act, 5 U.S.C. Section 552, and EPA's Business Confidentiality Regulations, 40 CFR Part 2 *(see especially 40 CFR 2.305)*. Persons filing this form may make claims of confidentiality. Such claims must be clearly indicated by marking "confidential" on the specific information on the form for which confidential treatment is requested or on any attachments, and must be accompanied, **at the time of filing**, by a written substantiation of the claim, by answering the following questions:

Confidential Information *(continued)*

A. Which portions of the information do you claim are entitled to confidential treatment?

B. For how long is confidential treatment desired for this information?

C. What measures have you taken to guard against undesired disclosure of the information to others?

D. To what extent has the information been disclosed to others, and what precautions have been taken in connection with that disclosure?

E. Has EPA or any other Federal agency made a pertinent confidentiality determination? If so, include a copy of such determination or reference to it, if available.

F. Will disclosure of the information be likely to result in substantial harmful effects on your competitive position? If so, what would those harmful effects be and why should they be viewed as substantial? Explain the causal relationship between disclosure and the harmful effects.

Information covered by a confidentiality claim and the above substantiation will be disclosed by EPA only to the extent and by means of the procedures set forth in 40 CFR Part 2.

If no claim of confidentiality or no substantiation accompanies the information when it is submitted, EPA may make the information available to the public without further notice to the submitter.

Definitions

Terms used in these instructions and in this form are defined in the Glossary section of the instructions to Form 1. For additional definitions and procedures to use in applying for a permit for a hazardous waste management facility, refer to the regulations promulgated under Section 3005 of RCRA and published in 40 CFR Parts 122 and 124.

FORM 3 LINE–BY–LINE INSTRUCTIONS

Completing This Form

Please type or print in the unshaded areas only. Some items have small graduation marks or boxes in the fill–in spaces. These marks indicate the number of characters that may be entered into our data system. The marks are spaced at 1/6" intervals which accommodate elite type *(12 characters per inch – one space between letters)*. If you do not have a typewriter with elite type then please print, placing each character between the marks. Abbreviate if necessary to stay within the number of characters allowed for each item. Use one space for breaks between words, but not for punctuation marks unless the space is needed to clarify your information.

Item I

Existing hazardous waste management facilities should enter their EPA Identification Number *(If known)*. New facilities should leave this item blank.

Item II

A. FIRST APPLICATION. If this is the first application that is being filed for the facility place an "X" in either the Existing Facility box or the New Facility box.

1. EXISTING FACILITY. Existing facilities are:

   a. Those facilities which received hazardous waste for treatment, storage, and/or disposal on or before October 21, 1976; or

   b. Those facilities for which construction had commenced on or before October 21, 1976. Construction had "commenced" only if:

      (1) The owner or operator had obtained all necessary Federal, State, and local preconstruction approvals or permits; and

Item II *(continued)*

(2-a) A continuous physical, on–site construction program had begun *(facility design or other preliminary non–physical and non–site specific preparatory activities do not constitute an on–site construction program)*, or

(2-b) The owner or operator had entered into contractual obligations *(options to purchase or contracts for feasibility, engineering, and design studies do not constitute contractual obligations)* which could not be cancelled or modified without substantial loss. Generally, a loss is deemed substantial if the amount an owner or operator must pay to cancel construction agreements or stop construction exceeds 10% of the total project cost.

(NOTE: This definition of "existing facility" reflects the literal language of the statute. However, EPA believes that amendments to RCRA now in conference will shortly be enacted and will change the date for determining when a facility is an "existing facility" to one no earlier than May of 1980; indications are the conferees are considering October 30, 1980. When those amendments are enacted, EPA will amend the definition of "existing facility."

Accordingly, EPA encourages every facility built or under construction on the promulgation date of the RCRA program regulations to notify EPA and file Part A of the permit application so that it can be quickly processed for interim status when the change in the law takes effect.)

EXISTING FACILITY DATE. If the Existing Facility box is marked, enter the date hazardous waste operations began *(i.e., the date the facility began treating, storing, or disposing of hazardous waste)* or the date construction commenced.

2. NEW FACILITY. New facilities are all facilities for which construction commenced, or will commence, after October 21, 1976.

NEW FACILITY DATE. If the New Facility box is marked, enter the date that operation began or is expected to begin.

B. REVISED APPLICATION. If this is a subsequent application that is being filed to amend data filed in a previous application, place an "X" in the appropriate box to indicate whether the facility has interim status or a permit.

1. FACILITY HAS INTERIM STATUS. Place an "X" in this box if this is a revised application to make changes at a facility during the interim status period.

2. FACILITY HAS A PERMIT. Place an "X" in this box if this is a revised application to make changes at a facility for which a permit has been issued.

(NOTE: When submitting a revised application, applicants must resubmit in their entirety each item on the application for which changes are requested. In addition, Items I and IX [and Item X if applicable] must be completed. It is not necessary to resubmit information for other items that will not change).

Item III

The information in Item III describes all the processes that will be used to treat, store, or dispose of hazardous waste at the facility. The design capacity of each process must be provided as part of the description. The design capacity of injection wells and landfills at existing facilities should be measured as the remaining, unused capacity. See the form for the detailed instructions to Item III.

Item IV

The information in Item IV describes all the hazardous wastes that will be treated, stored, or disposed at the facility. In addition, the processes that will be used to treat, store, or dispose of each waste and the estimated annual quantity of each waste must be provided. See the form for the detailed instructions to Item IV.

Item V

All existing facilities must include a drawing showing the general layout of the facility. This drawing should be approximately to scale and fit in the space provided on the form. This drawing should show the following:

The property boundaries of the facility;

The areas occupied by all storage, treatment, or disposal operations that will be used during interim status;

The name of each operation. *(Example – multiple hearth incinerator, drum storage area, etc.)*;

Areas of past storage, treatment, or disposal operations;

Areas of future storage, treatment, or disposal operations; and

The approximate dimensions of the property boundaries and all storage, treatment, and disposal areas.

See Figure 3–1 for an example of a facility drawing. New facilities do not have to complete this item.

Item VI

All existing facilities must include photographs that clearly delineate all existing structures; all existing areas for storing, treating, or disposing of hazardous waste; and all known sites of future storage, treatment, or disposal operations. Photographs may be color or black and white, ground–level or aerial. Indicate the date the photograph was taken on the back of each photograph.

Item VII

Enter the latitude and longitude of the facility in degrees, minutes, and seconds. For larger facilities, enter the latitude and longitude at the approximate mid–point of the facility. You may use the map you provided for Item XI of Form 1 to determine latitude and longitude. Latitude and longitude information is also available from Regional Offices of the U.S. Department of Interior, Geological Survey and from State Agencies, such as the Department of Natural Resources.

Item VIII

See the form for the instructions to Item VIII.

Item IX and Item X

All facility owners must sign Item IX. If the facility will be operated by someone other than the owner, then the operator must sign Item X. Federal regulations require the certification to be signed as follows:

A. For a corporation, by a principal executive officer at least the level of vice president;

B. For a partnership or sole proprietorship, by a general partner o the proprietor, respectively; or

C. For a municipality, State, Federal, or other public facility, b either a principal executive officer or ranking elected official.

The Resource Conservation and Recovery Act provides for sever penalties for submitting false information on this application form

Section 3008(d) of the Resource Conservation and Recovery Ac provides that "Any person who knowingly makes any false statemen or representation in any application, . . . shall, upon conviction b subject to a fine of not more than $25,000 for each day of violation or to imprisonment not to exceed one year, or both."

Continued from page 4

V. FACILITY DRAWING *(see page 4)*

EXAMPLE

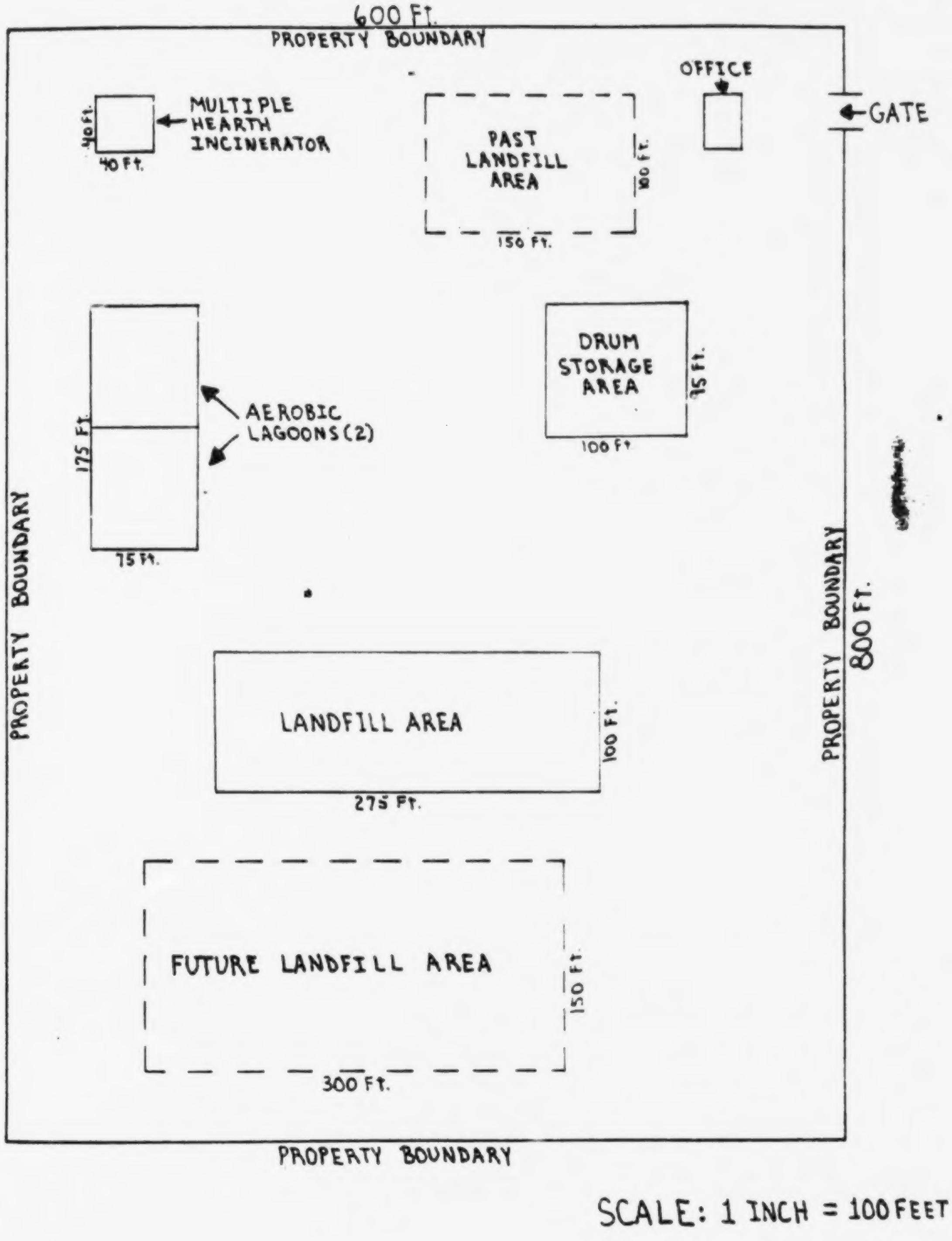
600 Ft.
PROPERTY BOUNDARY
OFFICE
GATE
MULTIPLE HEARTH INCINERATOR
40 Ft.
40 Ft.
PAST LANDFILL AREA
100 Ft.
150 Ft.
DRUM STORAGE AREA
75 Ft.
100 Ft.
AEROBIC LAGOONS (2)
175 Ft.
75 Ft.
PROPERTY BOUNDARY
PROPERTY BOUNDARY
800 Ft.
LANDFILL AREA
100 Ft.
275 Ft.
FUTURE LANDFILL AREA
150 Ft.
300 Ft.
PROPERTY BOUNDARY
SCALE: 1 INCH = 100 FEET

FIGURE 3-1

Please print or type in the unshaded areas only
(fill—in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-S80004

FORM 3 RCRA **EPA**

U.S. ENVIRONMENTAL PROTECTION AGENCY

HAZARDOUS WASTE PERMIT APPLICATION

Consolidated Permits Program

(This information is required under Section 3005 of RCRA.)

I. EPA I.D. NUMBER

F | | | | | | | | | | | | T/A C 1

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

☐ 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

☐ 2. NEW FACILITY *(Complete item below.)*

C 8 | YR. | MO. | DAY | FOR EXISTING FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

| YR. | MO. | DAY | FOR NEW FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR IS EXPECTED TO BEGIN

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

☐ 1. FACILITY HAS INTERIM STATUS

☐ 2. FACILITY HAS A RCRA PERMIT

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code*(s)* in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY – For each code entered in column A enter the capacity of the process.

1. AMOUNT – Enter the amount.
2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER *(barrel, drum, etc.)*	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D79	GALLONS OR LITERS
LANDFILL	D80	ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER
LAND APPLICATION	D81	ACRES OR HECTARES
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)*	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G
LITERS	L
CUBIC YARDS	Y
CUBIC METERS	C
GALLONS PER DAY	U
LITERS PER DAY	V
TONS PER HOUR	D
METRIC TONS PER HOUR	W
GALLONS PER HOUR	E
LITERS PER HOUR	H
ACRE-FEET	A
HECTARE-METER	F
ACRES	B
HECTARES	Q

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C DUP T/A C 1

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY	LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT	2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S 0 2	600	G		5				
X-2	T 0 3	20	E		6				
1					7				
2					8				
3					9				
4					10				

EPA Form 3510-3 (6-80)

CONTINUE ON REVERSE

3-4

Continued from the front.

IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

EPA I.D. NO. *(enter from page 1)*	T/A	C
F		6

V. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail).*

VI. PHOTOGRAPHS

All existing facilities must include photographs *(aerial or ground–level)* that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail).*

VII. FACILITY GEOGRAPHIC LOCATION

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*

VIII. FACILITY OWNER

☐ A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. *(area code & no.)*
E	– –

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE
F	G		

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED

CONTINUE ON PAGE 5

3-5

APPENDIX B

CROSS REFERENCE OF PART 122 REGULATIONS TO PART 270

List of Subjects

40 CFR Part 122

Administrative practice and procedure, Reporting and recordkeeping requirements, Water pollution control, Confidential business information.

40 CFR Part 123

Indians—lands, Reporting and recordkeeping requirements, Water pollution control, Intergovernmental relations, Penalties, Confidential business information.

40 CFR Part 124

Administrative practice and procedure, Air pollution control, Hazardous materials, Waste treatment and disposal, Water pollution control, Water supply, Indians—lands.

40 CFR Part 125

Water pollution control, Waste treatment and disposal.

40 CFR Part 144

Administrative practice and procedure, Reporting and recordkeeping requirements, Confidential business information, Water supply.

40 CFR Part 145

Indians—lands, Reporting and recordkeeping requirements, Intergovernmental relations, Penalties, Confidential business information. Water supply.

40 CFR Part 146

Hazardous materials, Reporting and recordkeeping requirements, Waste treatment and disposal, Water supply.

40 CFR Part 233

Administrative practice and procedure, Reporting and recordkeeping requirements, Confidential business information, Water supply, Indians—lands, intergovernmental relations, Penalties, Confidential business information.

40 CFR Part 260

Administrative practice and procedure, Confidential business information, Hazardous materials, Waste treatment and disposal.

40 CFR Part 261

Hazardous materials, Waste treatment and disposal, Recycling.

40 CFR Part 262

Hazardous materials, Imports, Labeling, Packaging and containers, Reporting and recordkeeping requirements, Waste treatment and disposal.

40 CFR Part 263

Hazardous materials transportation, Waste treatment and disposal.

40 CFR Part 264

Hazardous materials, Packaging and containers, Reporting and recordkeeping requirements, Security measures, Surety bonds, Waste treatment and disposal.

40 CFR Part 265

Hazardous materials, Packaging and containers, Reporting and recordkeeping requirements, Security measures, Surety bonds, Waste treatment and disposal, Water supply.

40 CFR Part 270

Administrative practice and procedure, Reporting and recordkeeping requirements, Hazardous materials, Waste treatments and disposal, Water pollution control, Water supply, Confidential business information.

40 CFR Part 271

Hazardous materials, Reporting and recordkeeping requirements, Waste treatment and disposal, Water pollution control, Water supply, Intergovernmental relations, Penalties, Confidential business information.

Dated: March 16, 1983.

John W. Hernandez,

Acting Administrator.

Authority: Clean Water Act, Safe Drinking Water Act, Clean Air Act, Resource Conservation and Recovery Act: 42 U.S.C. 6905, 6912, 6925, 6927, 6974.

Appendix

This appendix describes the reorganization of former Parts 122 and 123. Four tables follow—one for each program: NPDES, RCRA, UIC, 404. Each table lists all provisions of former Parts 122 and 123 applicable to the particular program and the new location at which the provisions are now presented.

NPDES Program

Below is a list of the NPDES-related sections in former Parts 122 and 123 and their corresponding sections in new Parts 122 and 123.

Name and old	New
What are the consolidated permit regulations?	
§ 122.1	
(a)	122.1(a).
(b)	122.1(c).
(c)	122.1(d).
(d)	122.1(g).
(e)	122.1(e).
(f)	122.1(f).
Purpose and scope of Part 123	
§ 123.2	
(a)	Removed.
(b)	Removed.
Definitions	
§ 122.3	122.2.
Application for a permit	
§ 122.4	
(a)	122.21(a).
(b)	122.21(b).
(c)	122.21(e).
(d)	122.21(f).
(e)	122.21(d).
Continuation of expiring permits	
§ 122.5	122.6.
Signatories to permit applications and reports	
§ 122.6	122.22.
Conditions applicable to all permits	
§ 122.7	122.41. (All sections are same paragraphs.)
Establishing permit conditions	
§ 122.8	122.43.
Duration of permits	
§ 122.9	
(a)	122.46(a).
(b)	Removed.
(c)	Removed.
(d)	122.46(b).
(e)	122.46(c).
Schedules of compliance	
§ 122.10	122.47.
Requirements for recording and reporting of monitoring results	
§ 122.11	[illegible]
Considerations under Federal law	
§ 122.12	[illegible]
Effect of a permit	
§ 122.13	[illegible]
Transfer of permits	
§ 122.14	122.61.
Modification or revocation and reissuance of permits	
§ 122.15	122.62.
(a)(5)(i)	122.62(a)(15).
(a)(5) (ii)–(vi)	122.62(a) (6)–(10).
(a)(6)	Removed.
Termination of permits	
§ 122.16	122.64.
Minor modifications of permits	
§ 122.17	122.63.
(g)	(e).
Noncompliance and program reporting by the Director	
§ 122.18	123.45.
(b)	Removed.
(c)	123.45(b).
(d)	Removed.
(e)	123.45(c).
Confidentiality of information	
§ 122.19	122.7.
Purpose and scope of Subpart D	
§ 122.51	
(a)	Removed.
(b)	122.1(g).
(c)(1)	122.1(h).
(c)(2)	122.3.
Prohibitions	
§ 122.52	122.4.
Application for a permit	
§ 122.53	
(a)	122.21(a).
(b)	122.21(b).
(c)	122.21(c).
(d)	122.21(g).
(e)	122.21(h).
(f)	122.21(i).
(g)	[illegible]
(h)	122.21(k).
(i)	122.21(l).
(j)	122.21(m).
(k)	122.21(n).

Name and old	New
Concentrated animal feeding operations	
§ 122.54	122.23.
Concentrated aquatic animal production facilities	
§ 122.55	122.24.
Aquaculture projects	
§ 122.56	122.25.
Separate storm sewers	
§ 122.57	122.26.
Silvicultural activities	
§ 122.58	122.27.
General permits	
§ 122.59	122.28.
Additional conditions applicable to all NPDES permits	
§ 122.60	122.41.
(a)	122.41(a).
(b)	122.41(c).
(c)	122.41(j)(4), (5).
(d)	122.41(k).
(e)	122.41(l)(2).
(f)	122.41(l)(6).
(g)	122.41(m).
(h)	122.41(n).
Additional conditions applicable to specified categories of NPDES permits	
§ 122.61	122.42.
Establishing NPDES permit conditions	
§ 122.62	122.44.
Calculating NPDES permit conditions	
§ 122.63	122.45.
Duration of certain NPDES permits	
§ 122.64	
(a)	122.46(d).
(b)	122.46(e).
(c)	122.46(f).
Disposal of pollutants into wells, into publicly owned treatment works or by land application	
§ 122.65	122.50.
New sources and new dischargers	
§ 122.66	122.29.
Purpose and scope	
§ 123.1	
(a)	123.1(a), (c).
(b)	Removed.
(c)	Removed.
(d)	Removed.
(e)	123.1(e).
(f)	123.1(c).
(g)	123.1(d).
(h)	123.1(f).
(i)	Removed.
(j)	123.1(h).
(k)	123.1(i).
Definitions	
§ 123.2	123.2.
Elements of a program submission	
§ 123.3	123.21.
Program description	
§ 123.4	123.22.
Attorney General's statement	
§ 123.5	123.23.
Memorandum of agreement with regional administrator	
§ 123.6	
(a)	123.24(d).
(g)	123.24(e).
Requirements for permitting	
§ 123.7	123.25.
(a)(1)	(a)(4).
(2)	(5).
(3)	(12).
(4)	(14).
(5)	(17).
(6)	(18).
(7)	(19).
(8)	(2).
(9)	(21).
(10)	(22).
(11)	(23).
(12)	§ 123.46.
(13)	123.25(a)(27).
(14)	(24).
(15)	(25).
(16)	(26).
(17)	(27).
(18)	(28).
(19)	(29).
(20)	(30).
(21)	(31).
(b)	Removed.
(c)	Removed.
(d)(1)	(a)(1).
(2)	(4).
(3)	(6).
(4)	(7).
(5)	(8).
(6)	(9).
(7)	(10).
(8)	(11).
(9)	(12).
(10)	(13).
(11)	(15).
(12)	(16).
(13)	(17).
(14)	(20).
(15)	(32).
(16)	(33).
(17)	(34).
(18)	(36).
(19)	(37).
(e)	(b).
Requirements for compliance evaluation programs	
§ 123.8	123.26.
Requirements for enforcement authority	
§ 123.9	123.27.
(a)(3)(ii)(A)	(a)(3)(i).
(a)(3)(ii)(B)	(a)(3)(ii).
(a)(3)(ii)(C)	(a)(3)(iii).
Sharing of information	
§ 123.10	123.41.
Coordination with other programs	
§ 123.11	123.3.
Approval process	
§ 123.12	123.61.
Procedures for revision of State programs	
§ 123.13	
(g)	123.62(e).
Criteria for withdrawal of State programs	
§ 123.14	123.63.
Procedures for withdrawal of State programs	
§ 123.15	123.64.
Purpose and scope	
§ 123.71	
(a)	123.1(e).
(b)	123.1(h).
(c)	123.1(g).
(d)	123.1(d).
Control of disposal of pollutants into wells	
§ 123.72	123.28.
Receipt and use of Federal information	
§ 123.73	123.42.
Transmission of information to EPA	
§ 123.74	123.43.
EPA review of and objections to State permits	
§ 123.75	123.44.
Prohibitions	
§ 123.76	123.29.
Approval process	
§ 123.77	123.61.

UIC Program

Below is a list of the UIC related sections in Parts 122 and 123 and their corresponding sections in Parts 144 and 145: Part 122 = 144.

Name and old	New
What are the consolidated regulations	
§ 122.1	§ 144.1.
Purpose and scope of part 122	
§ 122.2	§ 144.1.
Definitions	
§ 122.3	§ 144.3.
Application for a permit	
§ 122.4	§ 144.31.
§ 122.4(a)	Removed.
§ 122.4(b)	§ 144.31(b).
§ 122.4(c)	§ 144.31(c).
§ 122.4(d)	§ 144.31(d).
§ 122.4(e)	§ 144.31(e).
Continuation of expiring permits	
§ 122.5	§ 144.37.
Signatories to permit applications and reports	
§ 122.6	§ 144.32.
Conditions applicable to all permits	
§ 122.7	§ 144.51(a)–(l).
Establishing permit conditions	
§ 122.8	
§ 122.8(a)	§ 144.52(a).
§ 122.8(b)(1)–(3)	§ 144.52(b)(1)–(3).
§ 122.8(c)	§ 144.52(c).
Duration of permits	
§ 122.9	§ 144.36.
§ 122.9(c)	§ 144.36(a).
§ 122.9(d)	§ 144.36(b).
§ 122.9(e)	§ 144.36(c).
Schedule of compliance	
§ 122.10	[illegible]
§ 122.10(a)(1)(ii)	[illegible]
§ 122.10(a)(3)	[illegible]
§ 122.10(a)(4)	[illegible]
Requirements for recording and reporting of monitoring results	
§ 122.11	§ 144.54.
Considerations under Federal law	
§ 122.12	§ 144.4.
Effect of a permit	
§ 122.13	§ 144.35.
Transfer of permits	
§ 122.14	§ 144.38.
Modification or revocation and reissuance of permits	
§ 122.15	§ 144.39.
Termination of permits	
§ 122.16	§ 144.40.
Minor modification of permits	
§ 122.17	§ 144.41.
§ 122.17(f)(1)	§ 144.41(e).
§ 122.17(f)(2)	§ 144.41(f).
§ 122.17(f)(3)	§ 144.41(g).
Noncompliance and program reporting by the director	
§ 122.18	§ 144.8.
§ 122.18(c)	§ 144.8(b).
§ 122.18(c)(4)	§ 144.8(b)(2).
§ 122.18(e)	§ 144.8(c).
Confidentiality of information	
§ 122.19	§ 144.5.
Purpose and scope of subpart C (rewritten)	
§ 122.31	§ 144.1.
Classification of wells	
§ 122.32	§ 144.6.
Prohibition of unauthorized injection	
§ 122.33	§ 144.11.
Prohibition of movement of fluid into underground sources of drinking water	
§ 122.34	§ 144.12.
Identification of underground sources of drinking water and exempted aquifers	
§ 122.35	§ 144.7.
Elimination of certain class IV wells	
§ 122.36	§ 144.13.
Authorization of underground injection by rule	
§ 122.37	

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Name and old	New
§ 122.37(a)(1)	§ 144.21.
§ 122.37(a)(2)	§ 144.22.
§ 122.37(a)(3)	§ 144.23.
§ 122.37(a)(4)	§ 144.24.
§ 122.37(b)	§ 144.25.
§ 122.37(c)	§ 144.26.
§ 122.37(d)	§ 144.15.
Application for a permit; authorization by permit	
§ 122.38	
§ 122.38(a)	§ 144.31(a).
§ 122.38(b)	§ 144.31(c).
§ 122.38(c)	§ 144.31(g).
Area permits	
§ 122.39	§ 144.33.
Emergency permits	
§ 122.40	§ 144.34.
Additional conditions applicable to all UIC perm. s	
§ 122.41	
§ 122.41(a)	§ 144.51(a).
§ 122.41(b)	§ 144.51(j)(2)(ii).
§ 122.41(c)	§ 144.51(m).
§ 122.41(d)	§ 144.51(1)(6).
§ 122.41(e)	§ 144.51(n).
Establishing UIC permit conditions	
§ 122.42	
§ 122.42(a)	§ 144.52(a)(1).
§ 122.42(b)	§ 144.52(a)(2).
§ 122.42(c)	§ 144.52(a)(3).
§ 122.42(d)	§ 144.52(a)(4).
§ 122.42(e)	§ 144.52(a)(5).
§ 122.42(f)	§ 144.52(a)(6).
§ 122.42(g)	§ 144.52(a)(7).
§ 122.42(h)	§ 144.52(a)(8).
§ 122.42(i)	§ 144.52(b)(1).
Waiver of requirements by director	
§ 122.43	§ 144.16.
Corrective action	
§ 122.44	§ 144.55.
Requirements for wells injecting hazardous waste	
§ 122.45	§ 144.14.
Promulgation of class II programs for Indian lands	
§ 122.46	§ 144.2.
Purpose and scope	
§ 123.1	
§ 123.1(a)	§ 145.1(a).
§ 123.1(b)	Deleted.
§ 123.1(c)	§ 145.1(b).
§ 123.1(d)	§ 145.1(c).
§ 123.1(e)	§ 145.1(d).
§ 123.1(f)	§ 145.31(d).
§ 123.1(g)	§ 145.21(e).
§ 123.1(h)	§ 145.1(f).
§ 123.1(i)	Deleted.
§ 123.1(j)	§ 145.21(f).
§ 123.1(k)	§ 145.1(g).
Definitions	
§ 123.2	§ 145.2.
Elements of a program submission	
§ 123.3	§ 145.21.
Program description	
§ 123.4	§ 145.22.
§ 123.4(g)	§ 145.22(f).
Attorney General's statement	
§ 123.5	§ 145.23.
Memorandum of agreement with the regional administrator	
§ 123.6	§ 145.24
Requirements for permitting	
§ 123.7	§ 145.11.
§ 123.7(a)(1)–(21)	§ 145.11(a)(1)–(21).
§ 123.7(c)(1)–(12)	§ 145.11(a)(22)–(33).
Requirements for compliance evaluation programs	
§ 123.8	§ 145.12
Requirements for enforcement authority	
§ 123.9	§ 145.13.
§ 123.9(a)(3)(ii)(A)	§ 145.13(a)(3)(i).
§ 123.9(a)(3)(ii)(B)	§ 145.13(a)(3)(ii).
Sharing of information	
§ 123.10	§ 145.14
Coordination with other programs	
§ 123.11	Removed.
Approval process	
§ 123.12	§ 145.31.
Procedure for revision of State programs	
§ 123.13	§ 145.32.
§ 123.13(f)	§ 145.32(e).
Criteria for withdrawal of State programs	
§ 123.14	§ 145.33.
Procedures for withdrawal of State programs	
§ 123.15	§ 145.34.
§ 123.15(a)	§ 145.34(a).
Purpose and scope of subpart C	
§ 123.51	§ 145.1.
§ 123.51(a)	Deleted.
§ 123.51(b)	§ 145.21(a).
§ 123.51(c)	§ 145.21(c).
§ 123.51(d)	§ 145.21(d).
§ 123.51(e)	§ 145.21([illegible]
Requirement to obtain a permit	
§ 123.52	§ 145.11(a)(27).
Progress reports	
§ 123.53	§ 145.21(b).
Approval process	
§ 123.54	§ 145.31.
§ 123.54(a)–(c)	§ 145.31(a)–(c).
§ 123.54(d)	§ 145.31(e).
Procedures for withdrawal of State UIC programs	
§ 123.55	§ 145.34.
§ 123.55(a)	§ 145.34(b)(1).
§ 123.55(b)	§ 145.34(b)(2).
§ 123.55(c)	§ 145.34(b)(3).

404 Program

Below is a list of the 404 related sections in Parts 122 and 123 and their corresponding sections in Part 233.

Old name	New
What are the consolidated permit regulations? (Purpose and scope of Part 233).	
122.1	233.1.
122.1(a)	233.1(a).
122.1(b)(1) (i)–(iii)	233.1(b) (1)–(4)
122.1(b) (2)–(4)	Removed.
122.1(c) (1)–(2)	233.1(c) (1)–(2).
122.1(d)	Removed.
122.1(e)	233.1(d).
122.1(f)	233.1(e).
Purpose and scope	
122.2	233.2.
122.2(a)	233.2.
122.2(b)	Removed.
Definitions	
122.3	233.3.
Application for a permit	
122.4	233.4.
122.4(a)	233.4(b).
122.4(b)	233.4(c).
122.4(c)	233.4(d).
122.4(d)	233.4(e).
122.4(e)	233.4(f).
Continuation of expiring permits	
122.5	233.5.
122.5 (a)–(c)	Removed.
122.5(d)	233.5.
Signatories to permit application and reports	
122.6	233.6.
122.6 (a)–(d)	233.6 (a)–(d).
Conditions applicable to all permits	
122.7	233.7.
122.7 (a)–(f)	233.7 (a)–(f).
Establishing permit conditions	
122.8	233.8.
122.8 (a)–(b)	233.8 (a)–(b).
122.8(c)	233.8(d).
Duration of permits	
122.9	233.9.
122.9(a)	233.9(a).
122.9 (b)–(c)	Removed.
122.9 (d)–(e)	233.9 (b)–(c).
Schedules of compliance	
122.10	233.10.
122.10(a)	233.10(a).
122.10(a)(1)	233.10(a)(1).
122.10(a)(1) (i) and (ii)	Removed.
122.10(a)(2)	Removed.
122.10(a)(3)	233.10(a)(2).
122.10(a)(4)	233.10(a)(3).
122.10(b)	Removed.
Requirements for recording and reporting of monitoring results	
122.11	233.11.
122.11 (a)–(c)	233.11 (a)–(c).
Consideration under Federal law	
122.12	Removed.
Effect of a permit	
122.13	233.12.
122.13 (a)–(b)	233.12 (a)–(b).
122.13(c)	Removed.
Transfer of permits	
122.14	233.13.
122.14(a)	233.13.
122.14(b)	Removed.
Modification or revocation and reissuance of permits	
122.15	233.14.
122.15(a)(1)–(2)	233.14(a)(1)–(2).
122.15(a)(3)(i)–(ii)	233.14(a)(3)(i)–(ii).
122.15(a)(3)(iii)	Removed.
122.15(a)(4)	233.14(a)(4).
122.15(a)(5)	Removed.
122.15(a)(6)	233.14(a)(5).
122.15(b)	233.14(b).
122.15(c)	Removed.
Termination of permits	
122.16	233.15.
122.16(a)(1)	233.15(a).
122.16(a)(2)	233.15(b).
122.16(a)(3)	233.15(c).
122.16(a)(4)	233.15(d).
122.16(b)	Removed.
Minor modification of permits	
122.17	233.16.
122.17(a)–(d)	233.16(a)–(d).
122.17(e)–(g)	Removed.
122.17(h)	233.16(e).

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Old name	New
Noncompliance and program reporting by the director	
122.18	233.17
122.18(a)	Removed
122.18(b)	233.17(a).
122.18(c)	Removed.
122.18(d)	233.17(b).
122.18(e)	233.17(c).
Confidentiality of information	
122.19	233.18.
122.19(a)	Removed.
122.19(b)(1)	233.18(a)(1).
122.19(b)(2)–(3)	Removed.
122.19(b)(4)	233.18(a)(3).
122.19(c)–(d)	Removed.
Purpose and scope	
123.1	233.20.
123.1(a)	233.20(a).
123.1(b)	Removed.
123.1(c)	233.20(b).
123.1(d)	233.20(c).
123.1(e)	233.20(d).
123.1(f)	233.20(e).
123.1(g)	233.20(f).
123.1(h)	233.20(g).
123.1(i)	233.20(h).
123.1(j)	233.20(i).
123.1(k)	233.20(j).
Definitions	
123.2	Removed.
Elements of a program submission	
123.3	233.21.
123.3(a)–(d)	233.21(a)–(d).
Program description	
123.4	233.22.
123.4(a)–(e)	233.22(a)–(e).
123.4(f)–(g)	Removed.
123.4(h)(1)–(8)	233.22(f)–(m).
Attorney General's statement	
123.5	233.23.
123.5(a)–(b)	233.23(a)–(b).
123.5(c)	Removed.
123.5(d)	233.23(c).
Memorandum of agreement with the Regional Administrator	
123.6	233.24.
123.6(a)	233.24(a).
123.6(b)(1)	Removed.
123.6(b)(2)–(3)	233.24(b)(1)–(2).
123.6(b)(4)	233.24(b)(3.)
123.6(b)(5)	Removed.
123.6(b)(6)	233.24(b)(4.)
123.6(c)	233.24(c).
123.6(d)	Removed.
123.6(e)	Removed.
123.6(f)	233.24(d)
123.6(g)	233.24(e).
Requirements for permitting	
123.7	233.26.
123.7(a)	233.26(a).
123.7(b)–(d)	Removed.
123.7(e)	233.26(b).
Requirements for enforcement evaluation programs	
123.8	233.27.
123.8(a)–(d)	233.27(a)–(d).
123.8(e)	Removed.
Requirements for enforcement authority	
123.9	233.28.
123.9(a)(3)	238.28(a)(4).
123.9(a)(3)(i)–(ii)	Removed.
123.9(a)(3)(iii)	233.28(a)(4)(i).
Sharing of information	
123.10	233.29.
Coordination with other programs	
123.11	233.30.
Approval process	
123.12	233.31.
Procedures for revision of State programs	
123.13	233.32.
123.13(a)–(d)	233.32(a)–(d.)
123.13(e)–(g)	Removed.
123.13(h)	233.32(e).
Criteria for withdrawal of State programs	
123.14	233.33.
Procedures for withdrawal of State programs	
123.15	233.34.
Purpose and scope	
123.91	
123.91(a)	Removed.
123.91(b)	Removed.
123.91(c)	233.20(f).
123.91(d)	233.37(d).
Activities not requiring permits	
123.92	233.35.
Prohibitions	
123.93	233.36.
Applications for a permit	
123.94	233.4
123.94(a)	233.4(a).
123.94(b)	233.4(b).
123.94(c)	233.4(e).
General permits	
123.95	233.37
Emergency permits	
123.96	233.38.
Permit conditions	
123.97	233.7.
123.97(a)–(d)	233.7(m)–(p).
Establishing permit conditions	
123.98	233.8.
123.98(a)–(g)	233.8(c)(1)–(7).
Memorandum of agreement with the Secretary	
123.99	233.25.
Transmission of information to EPA and other Federal agencies	
123.100	233.39.
EPA review of and objections to State permits	
123.101	233.40.
Coordination requirements	
123.102	233.41
Enforcement authority	
123.103	233.28(a)(3)
Approval process	
123.104	233.31.

Index of Changes to Parts 122 and 123

Below is a list of the RCRA related sections in Parts 122 and 123, and their corresponding sections in Parts 270 and 271:

Part 122 = Part 270

Name and old	New
What are the consolidated permit regulations?	
§ 122.1	270.1.
(a)(1)	(a)(1).
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5.2.3.3	Design of System to Prevent Overtopping
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6.4.3	Report Supporting Request for Exemption from Liner and Ground-Water Protection Requirements
6.5.3	Waste Treatment Plan
6.6.3	Ignitable and/or Reactive Waste Management Plan(s)
6.7.3	Management Plan for Incompatible Wastes
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GUIDE
SPECIFICATIONS
FOR
CONSTRUCTION
OF
FLEXIBLE MEMBRANE LINERS
FOR
HAZARDOUS WASTE DISPOSAL FACILITIES

FOREWORD

The following Guide Specifications represent an effort to establish a comprehensive framework to verify and document the construction of a flexible membrane liner (FML) system for hazardous waste disposal facilities. Some of the technical requirements may have significant impact upon the FML industry and review and comments should be solicited from industry representatives.

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INTRODUCTION

The Guide Specifications which follow are intended to be used by persons writing specifications for the construction of a flexible membrane liner (FML) for land disposal of hazardous wastes.

The specifications do not relate to design of the FML system but rather provide guidelines for control and verification of construction of the designed FML system. The guidelines are not all inclusive to the needs of each site but form a framework into which site specific requirements can be inserted. Where appropriate, choices are provided, with examples for high density polyethylene (HDPE), reinforced chlorosulfonated polyethylene (CSPER, known as "Hypalon") and polyvinyl chloride (PVC).

These specifications have recognized the need to verify that the installed FML must provide total containment of hazardous waste fluids. This recognition resulted in requirements for thorough quality control during FML fabrication and installation, and systematic documentation. Further, the recognition of the parties involved in FML installation and the need for these parties of agree on individual responsibilities have been highlighted.

Parties who may be involved with FML installation include: Designer, Earthwork Constructor, FML Fabricator, FML Installer, FML Manufacturer, Inspector, Monitor, Owner, Regulatory Authority, and Specifier. These terms are defined in the Appendix. Each of these parties may be involved in FML installation, or responsibilities defined for one party may be assumed by another party (ie, the FML Manufacturer may also be the FML Fabricator).

Reference is made in the text to the test procedures of the American Society for Testing and Materials (ASTM) and the Proposed Standards for Flexible Membrane Liners of the National Sanitation Foundation (NSF).

1 FML CONSTRUCTORS

1.1 FML Manufacturer

To demonstrate an ability to manufacture the FML rolls, the FML Manufacturer shall provide the Monitor with a list of at least ___ projects totaling a minimum of ___ hundreds of thousands m^2 (millions sq. ft), for which the FML Manufacturer supplied the same generic type of FML. For each project, the following information shall be provided: name and purpose of project, location, date, name of owner, designer, fabricator, and installer, type of FML, thickness, surface area, and available written information on the performance of the project.

1.2 FML Fabricator

The FML Fabricator shall be trained and qualified to fabricate the type of FML to be used for the project. The FML Fabricator shall be an approved and/or licensed Fabricator of the FML Manufacturer. A copy of the approval letter or license shall be submitted to the Monitor.

To demonstrate an ability to fabricate FML, the FML Fabricator shall provide the Monitor with a list of at least ____ previous fabrications, totaling a minimum of __ hundreds of thousands m^2 (millions sq. ft), completed with the same generic type of FML. For each fabrication, the following information shall be provided: name and purpose of project, location, date, name of owner, designer, manufacturer, and installer, type of FML, thickness, total amount of FML fabricated, type of seaming, and available written information on the performance of the project. Also, the FML Fabricator shall provide information on the factory size and equipment, and daily production quantity available.

1.3 FML Installer

The FML Installer shall be trained and qualified to install the type of FML to be used for the project. The FML Installer shall be an approved and/or licensed Installer of the FML Manufacturer and/or FML Fabricator. A copy of the approval letter or license shall be submitted to the Monitor.

To demonstrate an ability to install FML, the FML Installer shall provide the Monitor with a list of at least ____ previous installations, totaling a minimum of __ hundreds of thousands m^2 (millions sq. ft). For each installation, the following information shall be provided: name and purpose of project, location, date, name of owner, designer, manufacturer, fabricator and leader of the installer's crew, type of FML, thickness, surface area, type of seaming, duration of installation, and available written information on the performance of the project.

2 FLEXIBLE MEMBRANE LINER

2.1 Raw Materials

The FML shall be manufactured of first quality newly produced raw materials. The use of reclaimed polymers and other materials shall not be permitted. Recycling of materials containing reinforcing scrim shall not be permitted. Recycling scrap that does not contain scrim may be permitted.

The FML Manufacturer shall: (i) indicate the origin of raw materials; (ii) provide a copy of quality control certificates issued by the producer of raw materials; and (iii) provide reports on the tests conducted to verify the quality of the raw materials. These tests should include at least:

- Density (ASTM D792-66) and melt index (ASTM D 1238-79), for HDPE.

- Analysis of the chemical composition of the plasticizers, for PVC.

2.2 Rolls

The FML rolls shall be designed and manufactured specifically for the purpose of fluid containment. The FML shall be free of holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter.

The FML to be used for this project shall be ___ mm (__ mil) thick ___ (mention here the type of FML, such as HDPE; Hypalon; PVC). The FML shall meet the specifications listed in Table 1. (Note 1)

The following information shall be provided by the FML Manufacturer as an indication of the quality of the material supplied:

- Material properties sheet, pertaining to the FML to be used for the project, (including data regarding chemical compatibility of the FML with contacting fluids) shall be provided. The sheet should at least include all properties listed in Table 1. The allowable range in values of properties listed in the sheet must meet the specifications given in Table 1. The sheet shall provide minimum properties guaranteed by the FML Manufacturer and indicate test methods used. Unless otherwise specified, test methods shall be in accordance with NSF Proposed Standards.

- Quality control certificates pertaining to the rolls of material delivered to the site shall accompany the rolls. Each roll shall be identified by a unique manufacturing number. The quality control certificate shall include results of at least the following tests: thickness, tensile characteristics, and tear resistance (also, coefficient of thermal expansion-contraction for HDPE) (also: hydrostatic burst resistance, and ply adhesion, in the case of Hypalon). Unless otherwise necessary, test methods shall be in accordance with NSF Proposed Standards. The quality control certificates shall be signed by a responsible party employed by the FML Manufacturer, such as production manager, and shall be notarized.

2.2 (Continued for Hypalon)

The FML Manufacturer shall indicate the composition of roll material. The polymeric compound shall contain at least 45% by weight of "Hypalon type 45" as the sole elastomer. The reinforcing scrim shall be defined by the number of yarns per unit width (eg. per meter or per inch) in each direction and by the linear density (in kg/m, tex, or deniers) of the yarns. The type of polymer used for the reinforcing scrim shall also be indicated.

2.2 (Continued for unreinforced PVC)

The FML Manufacturer shall indicate the proportion by weight of plasticizers, and the amount of volatile loss measured using ASTM D 1203, method A. The maximum value of the volatile loss shall be ___. (Note: the NSF Proposed Standards recommend 0.7% for a 0.75 mm (30 mil) thick FML and 0.5% for a 1.15 mm (45 mil) thick FML; values for other FML thicknesses may be interpolated or extrapolated beyond the 1.15 mm (45 mil) value).

2.3 Blanket Fabrication

(Note: The entire section 2.3 shall be deleted if the rolls are not fabricated into blankets in a plant. This is usually the case for HDPE FML.)

2.3.1 Blanket Geometry

The FML shall be fabricated into blankets. Blanket sizes shall be: (i) proposed by the FML Fabricator; (ii) consistent with the instructions (if any) given by the Designer; and (iii) approved by the Monitor and the FML Installer.

2.3.2 Factory Seaming

The rolls shall be fabricated into the designed blanket sizes using one of the following seaming techniques: adhesive, heat seaming, or dielectric seaming.

The overlap shall provide the minimum required seam width (as indicated below). The seam shall extend to the edge of the sheet, so that no loose flap is present on the top side of the blanket. A loose flap is permissible on the bottom side of the fabricated blanket.

The rolls shall be laid out without tension and seamed without wrinkles or fishmouths. If wrinkles occur within the sheet due to the seaming process, the wrinkle shall not extend into the seamed width. Wrinkles which extend into the seamed width shall be treated as specified in Section 3.5.7.

The overlap area to be seamed shall be free from moisture, dust, dirt, debris of any kind, and foreign material. The fabrication area shall be in a clean, enclosed, temperature controlled facility.

The dielectric and heat seaming devices shall be accurately monitored and controlled at all times to effect a consistently acceptable seamed width. Dielectric bars or wheels with ribs shall effect the full specified seam width. Space between the bar ribs shall not be counted in the seam width.

2.3.2 (Continued for Hypalon)

To effect a clean, bondable surface, the seam interfaces shall be cleaned with trichlorethylene or perchlorethylene solvent before the Hypalon adhesive is applied. The Hypalon based adhesive product for seaming the rolls together shall be as recommended by the Hypalon FML Manufacturer. The adhesive product shall be applied as specified by the Hypalon FML Manufacturer with special attention to the ambient temperature and rolling pressure.

The minimum scrim-to-scrim seam widths shall be:

Hypalon based adhesive	50 mm (2 in.)
Heat seaming	25 mm (1 in.)
Dielectric seaming	25 mm (1 in.)

The minimum seam width shall be the scrim-to-scrim seam width, plus the selvage width.

2.3.2 (Continued for PVC)

The PVC adhesive used for seaming the rolls together shall be as recommended by the PVC FML Manufacturer and shall not be deleterious to the PVC FML material in any way after seaming. The adhesive product shall be applied as specified by the PVC FML Manufacturer with special attention to the ambient temperature and rolling pressure. The adhesive shall have been tested for longevity in contact with the PVC FML material and its application shall result in no appreciable stiffening of the FML. Prepared adhesive tapes shall not be used.

The minimum seam widths shall be:

	Unreinforced	Reinforced
PVC adhesive seaming	25 mm (1 in.)	50 mm (2 in.)
Heat seaming	25 mm (1 in.)	25 mm (1 in.)
Dielectric seaming	20 mm (3/4 in.)	25 mm (1 in.)

3 INSTALLATION

3.1 Definition of Responsibilities

All parties involved with FML installation shall attend a meeting held prior to installation of any FML. The purpose of this meeting is to: (i) define the responsibilities of each party; (ii) establish lines of authority and lines of communication; (iii) establish site specific quality control and monitoring procedures; and (iv) define the method of acceptance of the completed liner. The meeting shall be documented and minutes transmitted to all parties.

3.2 Surface Preparation

The upper 0.1 m (4 in.) of the supporting soil shall not contain stones larger than 25 mm (1 in.). The surface to be lined shall be rolled with a smooth drum steel or pneumatic roller so as to be free of irregularities, loose earth, and abrupt changes in grade. The surface preparation shall be done by the Earthwork Constructor. The FML Installer shall certify in writing that the surface on which the FML is to be installed is acceptable. Thereafter, the FML Installer shall provide the necessary equipment and personnel to maintain an acceptable soil surface during liner installation.

No FML shall be placed in an area which has become softened by precipitation (ie, unconfined compressive strength less than 50 kPa (0.5 tsf)).

3.2 (Specific to surface preparation when the FML is supported on a soil liner)

Special care must be taken to maintain the prepared soil surface in areas where the soil functions as an impermeable soil liner. The soil surface shall be observed daily by the Monitor and FML Installer to evaluate desiccation cracking. The daily observations shall also ascertain the effects of surface desiccation cracking upon the integrity of the soil liner. Prior to installation of any FML, the Designer and Monitor shall define in writing the maximum allowable crack depth and width which will not significantly affect the soil liner design intent. The Monitor shall inform the FML Installer of the requirements regarding crack depth and width. Precautions for reducing desiccation potential (ie, temporary FML cover) and crack repairs shall also be defined by the Designer and approved by the Monitor. (Note 2)

3.3 Handling of FML

3.3.1 Packaging

FML rolls or blankets shall be packaged and labeled prior to shipment to the site. The label shall indicate the FML Manufacturer, FML Fabricator, type of FML, thickness, and roll or blanket number.

3.3.2 Transportation

When transported to the site, FML rolls or blankets shall be handled by appropriate means so that no damage is caused. Wooden cases shall be strong enough to withstand impacts and rough handling without breaking or splintering.

Transportation shall be the responsibility of the FML Manufacturer (if fabrication is not required, which is usually the case of HDPE), or of the FML Fabricator (if fabrication is required, which is usually the case of Hypalon and PVC).

3.3.3 On-site Storage

Once on-site, storage of the FML is the responsibility of the FML Installer. The FML shall be protected from direct sunlight and heat to prevent degradation of the FML material and adhesion of individual whorls of a roll or layers of a blanket.

Adequate measures shall be taken to keep FML materials away from possible deteriorating sources (ie, vandalism, theft).

3.3.4 On-site Handling

On-site handling of the FML is the responsibility of the FML Installer. Appropriate handling equipment shall be used when moving rolled or folded FML from one place to another. Instructions for moving the FML shall be given by the FML Installer to the workers and shall be approved by the Monitor.

3.3.5 Panel Placement

Each roll or blanket shall be redesignated with a panel number. A panel is the unit area of in-place membrane which is to be seamed (ie, one roll may be cut into several panels). The FML shall be positioned on the site as shown in the layout drawings. Instructions on the boxes or wrapping containing the FML materials shall be followed to assure the panels are unrolled or unfolded in the proper direction for seaming. Only the panels which are to be anchored or seamed together in one day shall be unrolled or unfolded. Care shall be exercised to not damage the FML during this operation. All workers shall wear shoes which will not damage the FML.

Pulling FML panels shall be minimized to reduce permanent tension.

The following precautions should be taken to minimize the risk of damage by wind during panel placement:

- No more than one panel should be unrolled prior to seaming (unless authorized by the Monitor);
- Work shall be oriented according to the direction of prevailing winds if possible, unless otherwise specified;
- Adequate loading on FML panels to prevent uplift by wind shall be provided by sand bags, tires or any other means which will not damage the FML. Along the edges, loading shall be continuous, to avoid possible wind flow under the panels.

Any panels, which, in the judgement of the Monitor, become seriously damaged (torn or twisted permanently), shall be replaced. Less serious damage should be repaired according to Section 4.4.

FML placement shall not proceed at an ambient temperature below 5°C (41°F) or above 35°C (95°F), unless otherwise specified.

FML placement shall not be done when raining nor in an area of ponded water.

3.3.4 (Specific to HDPE)

The HDPE roll shall be installed so that there will be neither tension nor wrinkles at the average expected temperature of the final use condition.

3.3.4 (Specific to PVC)

Unless otherwise specified, the PVC panels shall be installed in a slack untensioned condition allowing for a 5% excess in each direction (unless otherwise specified).

3.4 Considerations of Site Geometry

3.4.1 Layout Drawings

The FML Installer shall produce layout drawings of the proposed FML placement pattern and seams prior to FML placement. The drawings shall indicate the panel configuration and location of seams. Field seams should be differentiated from factory seams (if any). (Note 3)

3.4.2 Anchor Trench

The anchor trench (if required) shall be constructed to the lines and width shown on the design drawings prior to FML placement. If clay soils, susceptible to desiccation, will be encountered in the anchor trench, no more than one days trench length shall be excavated in advance of the FML placement. Backfilling shall proceed rapidly, unless otherwise specified, to minimize desiccation potential of the anchor trench clay soils.

3.4.3 Installation Around Appurtenances

The FML shall be installed around any pipes, piers, concrete pits (or other appurtenance protruding through the FML) as detailed on the design drawings. Unless otherwise specified, a FML sleeve or shield shall initially be installed around each appurtenance, prior to the areal FML installation. After the FML has been placed and seamed, the final field seam connection between the appurtenance sleeve or shield and the FML shall be completed. A sufficient initial overlap of the appurtenance sleeve shall be maintained so that shifts in location of the FML can be accomodated.

Installation on rough surfaces such as concrete shall be carefully performed to minimize FML damage. Additional, loosely placed FML or geotextile sections may be used by the FML Installer as protection for the FML if approved by the Monitor. (Note 4)

All clamps, clips, bolts, nuts or other fasteners used to secure the FML around each appurtenance shall have a life-span equal to or exceeding the FML.

3.5 Field Seaming

3.5.1 Requirements of Personnel

All personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests.

At least one seamer shall have experience seaming at least one hundred thousand m^2 (1 million sq. ft.) of a FML of the same generic type as the FML used for the project using the same type of seaming method. This master seamer shall provide direct supervision over apprentice seamers.

Apprentice seamers shall be qualified by attending training sessions taught by the master seamer and performing at least two successful seaming tests under similar weather conditions using the seaming method used for production seaming.

3.5.2 Overlapping

3.5.2 (Specific to HDPE)

The panels shall be overlapped a minimum of 75 mm (3 in.)

3.5.2 (Specific to Hypalon and PVC, Heat Seaming)

The panels shall be overlapped a minimum of 100 mm (4 in.)

3.5.3 (Specific to Hypalon and PVC, Adhesive Seaming)

The panels shall be overlapped a minimum of 150 mm (6 in.).

3.5.3 Preparation

Prior to seaming, the seam area shall be clean and free of moisture, dust, dirt, debris of any kind, and foreign material.

3.5.3 (Specific to HDPE)

The seam overlaps shall be ground according to the FML Manufacturer's instructions.

3.5.3 (Specific to Hypalon)

The seam overlaps shall be cleaned with thrichlorethylene or perchlorethylene in accordance with the FML Manufacturer's instructions.

3.5.4 Seaming Equipment and Products

3.5.4 (Specific to HDPE)

Each seaming unit must include thermometers giving the temperature of the extrudate in the machine and at the nozzle.

3.5.4 (Specific to Hypalon and PVC, Heat Seaming)

The heat seaming device (hot air or hot wedge) shall include a thermometer allowing the temperature to be monitored.

3.5.4 (Specific to Hypalon and PVC, Adhesive Seaming)

The adhesive (bodied solvent compound or cement) shall be formulated in accordance with the FML Manufacturer's specifications.

3.5.5 Weather Conditions for Seaming

Weather conditions required for seaming are as follows: (i) no weld shall be done below 1°C (34°F); (ii) between 1°C (34°F) and 10°C (50°F), seaming is possible if the FML is preheated by either sun or hot air device, and if there is not excessive cooling resulting from wind (as determined by the Monitor); and (iii) above 10°C (50°F), no preheating is required. In all cases, the FML shall be dry.

3.5.6 Seaming Procedure

Seaming on horizontal surfaces shall commence at the center of a panel side and proceed to either end of a side (if possible) in an effort to reduce wrinkles and subsequent fishmouths at the seam interface. The direction of seaming on slopes shall be the most expedient direction for the type of seaming used. Seaming shall extend to the outside edge of panels to be placed in the anchor trench.

If the supporting soil is soft, a firm substrate shall be provided by using a homogeneous board, a conveyor belt, or similar hard surface directly under the seam overlap to effect proper rolling pressure.

3.5.6 (Specific to Hypalon and Reinforced PVC, Heat Seaming)

The width of the seam shall be 25 mm (1 in.) scrim to scrim. Then, the loose upper flap shall be bonded using either a hot air gun or an adhesive (bodied solvent, or cement).

3.5.6 (Specific to Hypalon and PVC, Adhesive Seaming)

The width of the seam shall be 100 mm (4 in.) starting from the edge of the FML placed on top (so there is no loose flap).

3.5.6 (Specific to Unreinforced PVC, Heat Seaming)

The width of the seam shall be 25 mm (1 in.) starting, if possible, from the edge of the FML placed on top. Any loose flap shall be bonded using either a hot air gun or an adhesive.

3.5.7 Procedure for Seaming Wrinkles

Fishmouths or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle back into the panel so as to effect a flat overlap. The cut fishmouths or wrinkles shall be seamed as well as possible, and shall then be patched with an oval or round patch of the same generic FML extending a minimum of 150 mm (6 in.) beyond the cut in all directions.

3.5.7 (Specific to Hypalon and PVC)

The patch shall be bonded over its entire area, using either a hot air gun or an adhesive (bodied solvent or cement).

3.5.8 Cap-stripe

Cap-strips shall be at least 75 mm (3 in.) wide and shall be centered over the completed seam edge. Cap-strips shall be of the same generic FML material as the liner but without reinforcing scrim. The thickness of cap-strip shall be ___ mm (_ mils) (at least 0.75 mm (30 mils)).

Cap-strips shall shall be placed on all field seams. They shall be placed only after quality control of the original seam has been performed.

3.5.8 (Specific to HDPE)

Cap-strips shall not be longer than 3 m (10 ft) long if they are not bonded over their entire surface.

3.5.8 (Specific to Hypalon and PVC)

Cap-strips shall not be placed on a loose flap (loose flaps shall be bonded as explained in Section 3.5.6). Cap-strips shall be bonded over their entire surface, using hot air gun or adhesives (either bodied solvent or cement).

3.5.8 (Specific to Hypalon and Reinforced PVC)

Cap-strips shall be placed on all seams where the reinforcing scrim daylights: (i) ends of rolls; (ii) tapered rolls in corners and other special locations of cells or ponds; and (iii) places where the unreinforced selvage is too narrow (smaller than 3 mm (1/8 in.)) or has been damaged.

3.6 Installation of Materials in Contact with the FML

3.6.1 Granular Materials

Granular materials (ie, for FML protection or as a leachate collection system) shall be placed by the FML Installer or Earthwork Constructor at the direct supervision of the FML Installer in a manner so as not to damage the FML.

Placement of a granular material layer shall commence after the FML anchor trench (if any) has been completely backfilled and compacted and the leachate collection sump structures (if any) have been installed.

Unless otherwise specified, initial granular material placement shall be done by placing the material at the toe of the lined slope and pushing the material up the side slope with a light dozer (eg. D-6) or other equipment approved by the Monitor. The full design thickness of the granular material layer shall be maintained when spreading the material. The granular layer shall be placed over the FML before any construction traffic is allowed. If necessary, an access ramp comprised of granular material shall [illegible] gradually advanced over the geomembrane to the bottom of the disposal cell. The [illegible] ramp and other highly trafficked areas shall be a minimum of 0.9 m (3 ft) thick. Rubber tired vehicles shall not be allowed where the granular layer is less than 0.9 m (3 ft) thick.

The layer of material shall be compacted using the dozer. The Monitor shall obtain direct layer thickness measurements to verify conformance with design drawing requirements.

3.6.2 Concrete

If concrete is to be placed on the FML, care should be taken to avoid all damage to the FML. Additional layers of FML or geotextiles should be considered as protection layers for the FML.

Note on 3.61

Recommended thickness:

1ft under dozer
2ft under rubber tired vehicles
3ft on slopes (ramp)

3.6.3 Geotextiles

Geotextiles shall be overlapped 0.3 m (1 ft) unless otherwise specified (Note 5). If necessary because of the wind, the overlaps can be glued together with spots of glue (one to three per meter) (at a distance of one to three feet). In general, overlaps shall be oriented parallel to the lines of maximum slope.

During the placement of the geotextile, care should be taken not to entrap stones in the geotextile.

Unless specially selected for their ultraviolet light resistance, geotextiles shall not be exposed more than seven days.

4 QUALITY CONTROL AND INSPECTION

4.1 Materials

The test reports, material properties sheets, and quality control certif[illegible] required in Sections 2.1 and 2.2 shall be supplied to the Monitor by the [illegible] Manufacturer prior to fabrication or installation if there is no fabrication).

The quality control certificates shall be reviewed by the Monitor to verify that a certificate has been received for all rolls.

4.2 Factory Seams

(Note: The entire Section 4.3 shall be deleted if the rolls are not fabricated into blankets in a plant. This is usually the case for HDPE FML.)

4.2.1 Inspection

The Monitor shall visit the FML Fabricator's plant and verify that:

- The plant is clean.
- Ambient temperature in the plant is adequate (higher than 10°C (50°F)).
- The specified rolls are used.

- The unreinforced selvage is wide enough (at least 3 mm (1/8 in.)).
- Seaming procedures recommended by the FML Manufacturer are followed.
- Appropriate seaming equipment and adhesive products are used.
- The specified overlaps are used.
- The factory seams have no upper loose flap.
- Non-destructive and destructive testing equipment is available in the plant.

The Monitor shall also:

- Observe non-destructive testing.
- Collect samples for destructive laboratory testing.
- Obtain, from the FML Fabricator, reports on quality control tests performed on factory seams.
- Obtain, from the FML Fabricator, daily reports on the plant's production, including number and identification of blankets, and number and identification of rolls used to fabricate each blanket.

4.2.2 Non-Destructive Testing

Non-destructive testing of factory seams shall be performed by the FML Fabricator. All factory seams shall be checked for loose flaps using an air nozzle directed on the upper seam edge and surface to detect unbonded overlaps within the seam. In addition, random vacuum seam testing shall be performed if required by the Monitor. All required repairs shall be made by the FML Fabricator before the FML blanket is packed for shipment.

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4.2.3 Destructive Testing

Destructive testing of specimens of factory seams shall be done by the FML Fabricator and by an independant laboratory designated by the Monitor.

One 0.45 m (18 in.) square sample, with a seam in the middle, shall be cut-off from each fabricated blanket. This sample can be cut-off at the edge of a blanket, or from an extra length of seam, in order not to make a hole. All holes, if any, remaining in the FML from destructive seam testing shall be immediately repaired in accordance with repair procedures described in Section 4.5.3.

Each sample for destructive seam test shall be numbered. The number and the location where the sample was taken from the blanket shall be recorded by the Monitor. One half of the sample shall be retained by the FML Fabricator, the other half by the Monitor.

Tests to be performed in a laboratory designated by the Monitor include [illegible] Seam Shear Strength" (ie, tensile shear) and "Peel Adhesion", as recommended in [illegible] Proposed Standards for FML. The specified values to be obtained in these [illegible] values recommended in the NSF Proposed Standards for FML for the [illegible] FML tested.

4.3 Transportation, Handling and Placement

Upon arrival at the site, the FML Installer and Monitor shall inspect all materials for defects in the manufacturing process and for damage during transportation. Materials judged by the Monitor to be severly damaged shall be rejected and removed from the site. Minor damages and other defects shall be repaired.

The Monitor shall inspect each panel, after placement and prior to seaming, for damage caused by placement operations or by wind. Damaged panels or portions of damaged panels which have been rejected, as judged by the Monitor, shall be marked and their removal from the work area recorded.

The Monitor shall also verify that the weather conditions (air temperature, non-excessive wind, and lack of precipitation) are acceptable for panel placement, in accordance with Section 3.3.5.

4.4 Field Seams

4.4.1 Field Seaming Operations

The Monitor shall verify that:

- The seaming personnel have the qualifications required in Section 3.5.1.
- The overlaps meet the requirements presented in Section 3.5.2.
- The seaming area is clean, as described in Section 3.5.3.
- A hard substrate such as a board or a piece of conveyor belt is used if the supporting soil is soft.
- Seaming equipment and adhesive products are available on the site [illegible] meet the requirements presented in Section 3.5.4.
- Weather conditions for seaming are acceptable, as required in Section 3.5.5.
- Seaming procedures described in Section 3.5.6 are followed.
- The panels are properly positioned to minimize wrinkling and wrinkled areas are seamed according to the procedures presented in Section 3.5.7.
- All cap-strips required in Section 3.5.8 are placed.
- Equipment for testing seams is available on site.

4.4.2 Test Seams

Test seams shall be performed to verify that seaming conditions are adequate. Test seams shall be conducted at the Monitor's discretion and at least two times each day (at the beginning of the morning and the beginning of the afternoon), for each seaming equipment or adhesive product used that day. Also, each seamer shall perform at least one test seam each day. Test seaming shall be performed under the same conditions as production seaming. The test seam shall be at least 0.6 m (2 ft) long.

Specimens shall be cut from the test seam. These specimens shall be ___ mm (__ in.) wide (eg, 10 mm (0.5 in.) in the case of HDPE or 50 mm (2 in.) in the case of Hypalon or PVC). Specimens shall be tested by hand in shear and peel, and shall not fail in the joint. If a test seam fails, an additional test seam shall be immediately conducted. If the additional test seam fails, the seaming equipment or product shall be rejected and not used for production seaming until the deficiencies are corrected and a successful full test seam is produced.

The Monitor shall observe all test seams. A sample from each test seam shall be retained and labeled with the date, ambient temperature, number of seaming unit, seamer, and pass or fail description. One half of the sample shall be given to the FML Installer for subsequent laboratory testing and the other half retained by the Monitor.

4.4.3 Non-Destructive Seam Testing

All field seams shall be non-destructively tested over their full length. [illegible] seam shall be numbered or otherwise designated. The location, date, test unit, [illegible] tester, and outcome of all non-destructive testing shall be recorded by the [illegible]

The Monitor shall observe all testing. Testing shall be done as the seaming work progresses, not at the completion of all field seaming. All defects found during testing shall be numbered and marked immediately after detection. All defects found shall be repaired, retested and remarked to indicate completion of the repair and acceptability.

4.4.3 (Continued for HDPE)

The test unit shall be a vacuum test unit or an ultrasonic test unit.

4.4.3 (Continued for Hypalon and PVC)

The test unit shall be air lance or vacuum test unit.

4.4.4 Destructive Seam Testing (Also see page 25a)

Destructive seam testing involves cutting out a sample of an existing seam for the purpose of verifying seam conditions through laboratory testing. Unless otherwise noted, destructive seam testing shall not be performed except as directed in Section 5.4.

The destructive testing specimen shall be a 0.45 m (18 in.) square sample with the seam in the middle.

Each destructive seam test sample shall be numbered. The sample number, seam number, location of sample along the seam, and reason for the destructive seam test shall be recorded on the test sample by the Monitor. One half of the test sample shall be retained by the FML Installer, the other half by the Monitor.

All holes remaining in the FML from taking destructive seam sample shall be immediately repaired in accordance with repair procedures described in Section 4.5.3. The new seams in the repaired area shall be tested according to Section 4.4.3.

Destructive seam test samples shall be stored and shipped in a manner which [illegible] not damage the test sample.

Seam

Tests to be performed in a laboratory designated by the Monitor include "Bonded Shear Strength" (ie, tensile shear) and "Peel Adhesion", as recommended in the NSF Proposed Standards for FML. The specified values to be obtained in these tests are the values recommended in the NSF Proposed Standards for FML for the particular type of FML tested.

4.4.5 Verification of Seams in Special Locations

All seams in special locations shall be non-destructively tested if the seam is accessible to testing equipment. If the seam cannot be tested in-place, but is accessible to testing equipment prior to final installation, the seam shall be non-destructively tested prior to final installation (eg, seams around pipes and appurtenances). The Monitor shall observe all seam testing operations. If the seam cannot be tested in-place, nor prior to final installation, it shall be observed by the Monitor and FML Installer, for uniformity and completeness.

The seam number, date of observation, name of tester, and outcome of the test or observation shall be recorded by the Monitor.

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4.6 Documentation

4.6.1 Material Quality Control Certificates

The quality control certificates pertaining to raw materials and manufactured FML rolls required in Sections 2.1 and 2.2 shall be provided by the FML Manufacturer to the Monitor prior to installation. The Monitor shall review the test results for completeness and for compliance with the required minimum properties for both the raw materials and manufactured FML rolls. Materials and rolls which are in non-compliance with the minimum required properties shall be rejected.

4.6.2 Surface Preparation Certificate

The FML Installer shall provide the certification of acceptance of surface preparation to the Monitor prior to any FML installation. Thereafter the FML Installer shall provide the Monitor written acceptance daily for the surface to be covered by FML in that days operations.

4.6.3 Daily Fabrication Reports

The FML Fabricator shall provide the Monitor with daily reports addressing: (i) the total amount of FML seamed; (ii) identifiers of rolls and fabricated blankets; (iii) quality control tests of materials used during the day; (iv) seaming equipment and products used; (v) names of seamers; and (vi) seam testing performed. The Monitor shall visit the FML Fabricator's plant and independently record observations of daily fabrication activities, including all testing performed.

4.6.4 Daily Field Installation Reports

The FML Installer shall provide the Monitor with daily reports of: (i) the total amount and location of FML placed; (ii) total amount and location of seams completed and seamer and units used; (iii) changes in layout drawings; (iv) results of test seams; (v) location and results of non-destructive testing; (vi) location and results of repairs and; (vii) location of destructive test samples.

The Monitor shall record daily all activities of the FML installation, which shall include but not be limited to:

- receipt of the written daily acceptance of surface preparation from the FML Installer;
- observations of all FML placement activities and record of defects caused during transportation and handling;
- observations of test seams, including seaming unit number or identification of adhesive products, names of seamers, weather conditions and results;
- observations of anchor trench excavation, backfilling and compaction;
- observations of field seaming operations, including weather conditions, cleaning, overlaps, rate of seaming, names of seamers and units used;
- observations of seams around appurtenances, and connections to appurtenances;
- observations of non-destructive seam testing, including testing locations, location of defects and testing unit used;
- observations of repairs and retesting, including locations, name of repairer and seaming equipment or product used.

5. PERFORMANCE REQUIREMENTS AND ACCEPTANCE OF INSTALLATION

5.1 Guarantees

The FML Manufacturer shall guarantee the FML materials to be free of defects for a period of __ years after manufacture. (*)

The FML Fabricator shall guarantee the factory seams to be free of defects for a period of __ years after fabrication.

The FML Installer shall guarantee the installed FML and field seams to be free of defects for a period of __ years after installation.

(*) It may be more realistic to request "... free of defects at installation completion".

5.2 Performance Expectations

It is expected that the FML installation will perform satisfactorily for a period of not less than __ years. The intent of the FML is to ~~minimize~~ prevent the migration of fluids to the adjacent subsurface soils and to ground water and surface water. Performance of the FML will be partially evaluated by observations and testing of the long term monitoring system.

5.3 Long Term Monitoring

5.3.1 Exterior Monitoring System

It shall be the responsibility of the Owner or Owner's representative to observe and test monitor wells exterior to the cell or impoundment area for compliance with the permitted monitoring program. The presence of significant levels of contaminants in these exterior monitoring wells may be judged to indicate non-performance of the FML installation. (*)

5.3.2 Leak Detection System

If the cell or impoundment design incorporates a leak detection system below or outside of the FML, it shall be the responsibility of the Owner or Owner's representative to monitor the leak detection system at regular intervals. Detection of leaks by the leak detection system may be judged to indicate non-performance of the FML installation.

5.3.3 Leachate Collection System (Specific to Land Disposal Cells and Waste Piles)

If a leachate collection system is incorporated into the design, it shall be the responsibility of the Owner or Owner's representative to monitor the leachate collection system and remove leachate at design levels or designated intervals. Failure to maintain design levels or pumping intervals may negate FML performance guarantees.

5.3.4 Coupon Monitoring Program

A coupon monitoring program shall be a part of the long term monitoring of durability of the FML and FML seams. Coupons (small samples of the FML with and

(*) EPA has not yet a policy regarding what is a failure.

without seam) shall be buried at the disposal site under the same construction conditions and shall be placed for ready retrieval at ~~construction intervals~~ locations to be determined by the Monitor.

5.4 FML Liner Acceptance

The FML liner shall be accepted by the Monitor when: (i) the installation is finished; (ii) all documentation of installation is completed; and (iii) verification of the adequacy of all field seams and repairs, and associated testing is complete.

A passing test seam shall be an indicator of the adequacy of the seaming unit and seamer working under prevailing site conditions, but not necessarily an indicator of seam adequacy. A passing non-destructive test of seams and repairs shall be taken to indicate the adequacy of field seams and repairs. If the laboratory tests of the field test seams fail, they shall be taken as an indicator of the possible inadequacy of the entire seamed [illegible] length corresponding to the test seam. Destructive test portions shall then be tak[illegible] the FML Installer at locations suggested by the Monitor and the same laboratory [illegible] required of test seams shall be performed. Passing tests shall be taken as an indica[illegible] adequate seams. Failing tests shall be an indicator of non-adequate seams and all [illegible] represented by the destructive test location shall be repaired with a cap-strip. The cap-strip shall be non-destructively tested and repaired, as required, until adequacy of the seams is achieved.

NOTES

Note 1 Table 1 should list the required properties of the FML, as determined by the Designer. Table 1 can be presented in a way similar to the tables of material properties presented in the NSF proposed standards.

Note 2 FML, such as 10 mil polyethylene, or other available FML may be used for temporary protection. A temporary FML should be overlapped 0.3 m (1 ft) and does not need to be seamed. The temporary FML may remain in place under the design FML. Crack repairs may consist of re-wetting, if a sufficient time is available for crack healing, or brooming dry powdered bentonite onto the soil surface to fill the cracks.

Note 3 In general, seams should be oriented parallel to line of the maximum slope. In corners and odd shaped geometric locations, the total length of field seams should be minimized. No seams should be placed at the toe but should be a minimum of 1.5 m (5 ft) away from the toe toward the inside of the cell or impoundment.

Note 4 Additional, loosely placed FML or geotextile sections may create a potential path for liquids between the FML and the supporting soil, which may be detrimental, especially if the supporting soil is a liner.

Note 5 Specifications regarding geotextiles (including plastic nets) used as drains should be prepared by the Designer.

APPENDIX

DEFINITION OF TERMS

Designer	- The organization or person who generated the design drawings and plans of the FML system including the supporting soil.
Earthwork Constructor	- The organization which is responsible for the preparation of the surface on which the FML is to be installed; also the party responsible for placing the granular materials over the installed FML.
FML Fabricator	- The organization responsible for production of FML blankets from FML rolls.
FML Installer	- The organization responsible for field unrolling, placing, seaming and other site aspects of the FML construction.
FML Manufacturer	- The organization responsible for productio[illegible] FML rolls from raw materials.
Inspector	- A person who observes the FML constr[illegible] but is not responsible for the moni[illegible] testing or documentation.
Monitor	- The organization or person independent of the FML Manufacturer, Fabricator and Installer that is responsible for observing and documenting most activities and testing and approving certain other activities relating to FML construction.
Owner	- The organization or person that owns the hazardous waste disposal facility.
Regulatory Authority	- The organization responsible for issuing a permit for the completed waste disposal facility.
Specifier	- The organization or person who generated the specifications for the FML construction.

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